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SEPTEMBER/OCTOBER 2002

Grape bunch exposure and aroma development

VARIETAL REVIEW
Oregon Pinot Noir

FOCUS: Pierce's disease

unlight and temperature in berry growth

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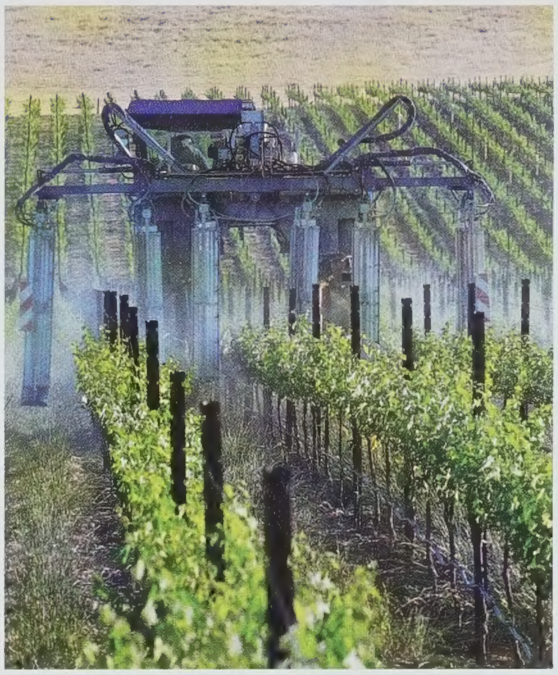

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"To stimulate continuing improvement in the wine industry."

View from the Vineyards

BY Nat DiBuduo, President
Allied Grape Growers

Many of us have seen the movie *Wizard of Oz*. While Dorothy was sleeping in her cozy bed in Kansas, the tornado hit! Likewise, while the California winegrape industry was enjoying the benefits of the 1990s, a tornado of grapevine plantings occurred.

Let's see what the damage is:

The estimated acreage of all grapes in 2001 was over 950,000. Of those, acres, 107,000 acres were non-bearing. Some 90,000 of the 107,000 non-bearing acres were winegrapes.

In 2001, even though approximately 20,000 acres were pulled out in the San Joaquin Valley, the total bearing acreage of winegrapes was 480,000 — an increase of 22,000 acres.

Thus far in 2002, another 15,000 to 20,000 acres have been pulled out in the San Joaquin Valley. However, 33,000 additional acres planted in 1999 officially moved into bearing status.

Another 28,000 acres planted in 2000 are yet to come into production, as are 18,000 acres planted in 2001.

In addition, we do not know how many acres are *not* being farmed this year, or how many have been planted in 2002. However, the following numbers do provide more of the story.

These comments are edited from an address to the 2002 annual meeting of the Allied Grape Growers held in both Fresno and Santa Rosa, CA, on July 11 / 12.

California acreage by variety (comparing 2001 to 2000):
Chardonnay up 4.5%
Chenin Blanc down 6%
French Colombard down 6%
White total up 1.6%

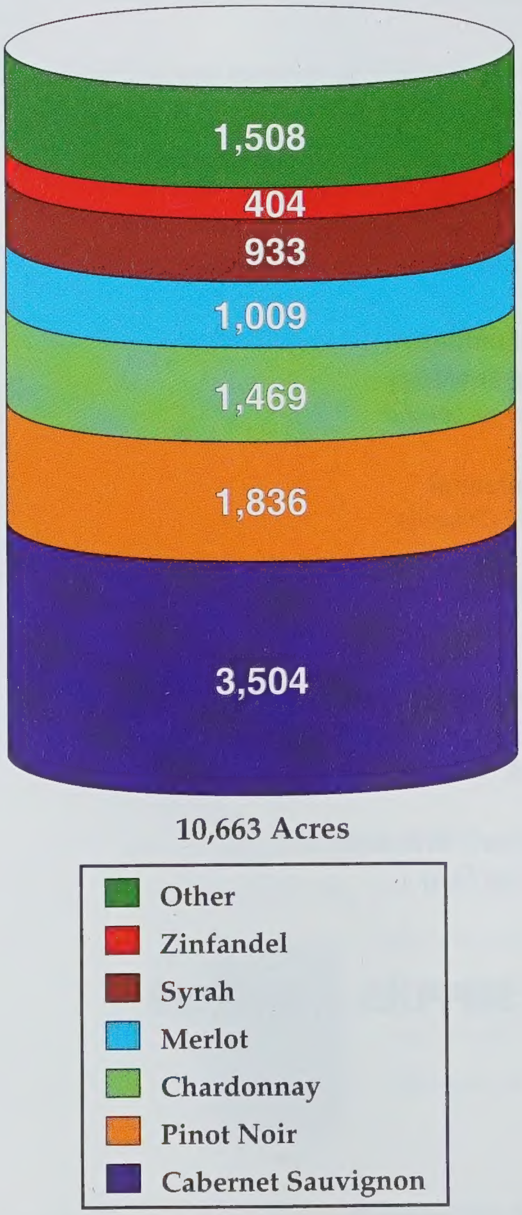
Cabernet Sauvignon up 16%
Merlot up 7.4%
Pinot Noir up 24.5%
Red total up 8.4%

Acres of Rubired:
In 1993 — 8,000 acres
In 2000 — 14,000 acres
In 2001 — 13,000 acres
In 2002 — 15,000 acres (estimate)

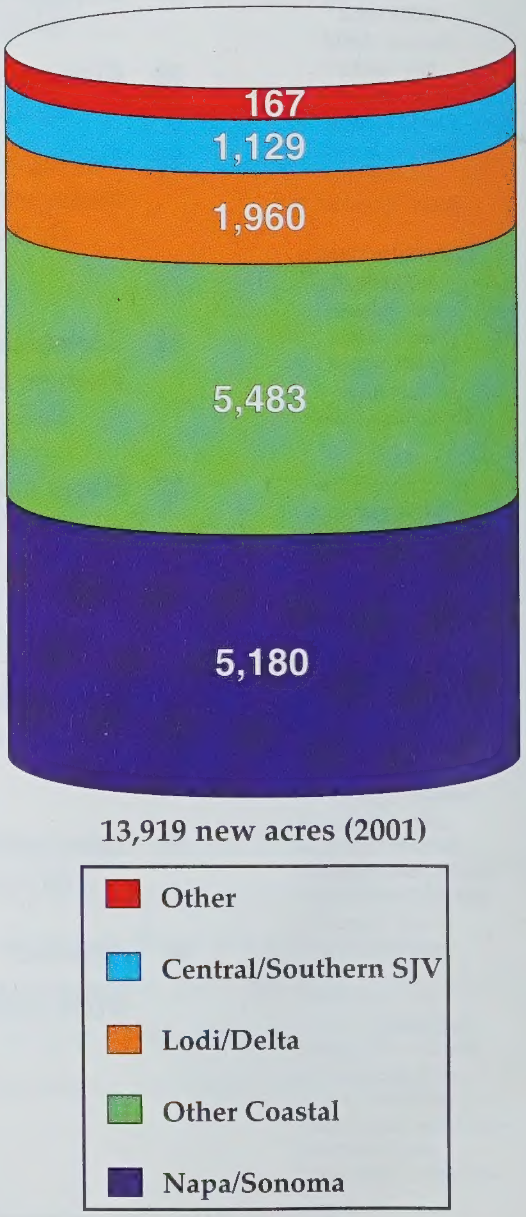
State-wide non-bearing acres: (percentage of total acres)
Cabernet Sauvignon — 24.4%
Merlot — 12%
Petite Sirah — 33%
Pinot Noir — 36%
Rubired — 18.4%
Zinfandel — 4.8%
Syrah — 50%
Total non-bearing red: 18%

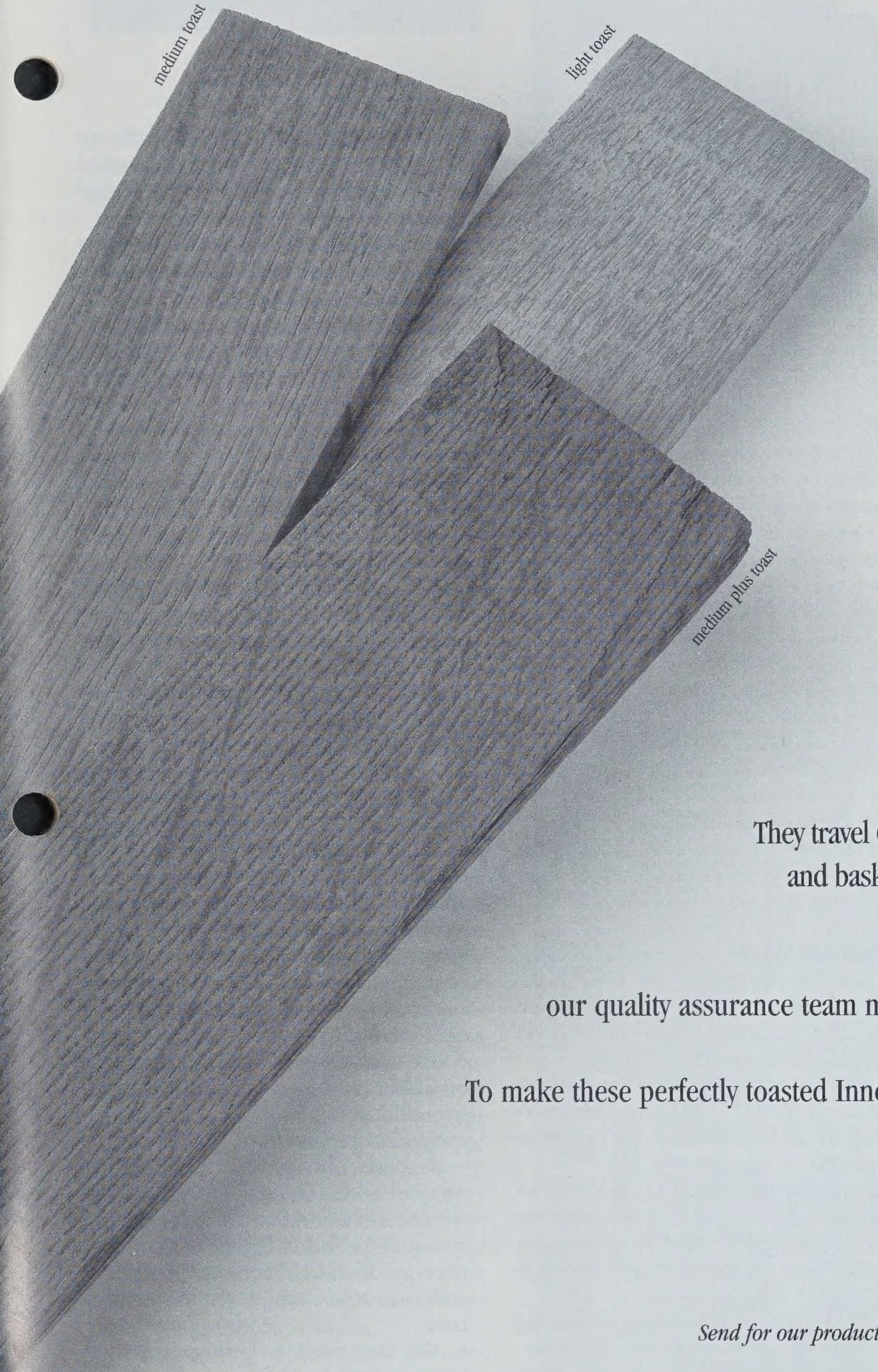
Chardonnay — 9.5%
Pinot Gris — 56%
Sauvignon Blanc — 12%
Total non-bearing white: 17%

Breakdown of coastal varietals planted in 2001



Breakdown of new winegrape acreage planted in 2001, statewide





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Napa/Sonoma counties non-bearing acres:
Cabernet Sauvignon — 29%
Pinot Noir — 34%

Central Coast non-bearing acres:
Chardonnay — 10%
Cabernet Sauvignon — 26%
Merlot — 20%
Pinot Noir — 39%
District #7 Merlot — 27%
San Joaquin Valley: Districts 12, 13, 14: Total 6.7% non-bearing
Northern Interior (District 11): Total 9% non-bearing

Grape estimates

The California grape estimate has been released by CASS with the following information:

	2002	2001	= / –
Raisin grapes			
2.55 M	10.4/acre	7.5/acre	up 38%
Winegrapes			
3.3 M	6.72/acre	6.25/acre	up 7%
Table grapes			
770,000	8.75/acre	7.92/acre	up 10%

Enough is Enough! While Dorothy fought off the lions and tigers and bears, the winegrape industry is fighting off the effects of overplanting.

We need to stop planting throughout California! We need to make *hard economic decisions* on individual vineyards. *We need to decide* whether to keep low-yielding, undesirable grapes in production.

Unless there is some new demand, there is an oversupply of many of the fighting varietals in California, as well as in the generic varietals planted throughout California (particularly in the San Joaquin Valley).

Wicked Witch of the West

On the way to the Emerald City to see the Wizard of Oz, Dorothy encountered a pretty scary witch. The wine industry faces its own witches or challenges:

- The *steady increase* in imports (up 14% to 3.7 million gallons) in the first quarter of 2002.
- The *strong dollar* (which is now softening) has held back potential U.S. exports due to the global market and competition, while also helping finance the imports coming into the U.S.
- To some extent — *ourselves.* When we have been driven by production, our quality has suffered.
- Decrease in sales of the so-called "jug" wines, wine that has been the backbone of the California wine industry (*i.e.* when there wasn't enough Cabernet Sauvignon, Merlot, and Chardonnay, the French Colombard, Chenin Blanc, Barbera, Carignane, and Thompson Seedless were blenders of necessity and choice).
- Large *inventory of bulk wine* of all varietals. Movement is slow and low prices are being paid for average or below-quality wines.
- *Newly planted acres* have been developed for both maximum quality and production on land never previously farmed for winegrapes.
- The romance of having a vineyard and maybe even a winery has drawn new discretionary income to compete with the traditional farmer.
- *Flat wine sales* in 2001, while production of grapes and bulk wine increased at double digits.

The Good Witch

Dorothy eventually got some help from Glenda, the Good Witch. I'm sure you are all waiting to learn how the good witch is helping us!

- *Wine Vision* is planning a course for the wine industry that is consumer-driven, to enhance drinking wine as an enjoyable experience.
- *Wine Market Council* is dedicated to fostering moderate wine consumption as part of the healthy lifestyle of the U.S. adult. "Wine — what are you saving it for?"
- Tim Hanni and WineQuest are getting the message out that wine is a consumer-friendly product without so many rules attached.
- The inventory of white grape concentrate is low and demand is good.
- *California wine sales* for the first quarter of 2002 were up 4% from 2001 — an increase of 4.4 million gallons.
- Legislators and the 215 members of the Congressional Wine Caucus *understand the importance* of the winegrape industry.
- *Exports* of U.S. wines abroad are up 2%, with a 33% increase to the United Kingdom. Bulk table wine exported was up 27%.
- Top 15 premium wineries had *first quarter shipments* up 9% — an increase of 2.1 million gallons.
- Although 77% of wine purchased in food stores is $7 and less, there has been an *increase in wine sales of 14% to 18%* in the $7 to $14 price range.
- *Allied Grape Growers (AGG) deals with over 60 different wineries* around California with various price points. AGG is a one-stop shop.

I want to go home

So how did Dorothy get back home? How will we get back economic security for our families now and in the future?

We don't have a Yellow Brick Road, or ruby slippers, and I'm certainly no wizard!

I believe that we need to follow the Road to Success. The road will be driven by two courses: First: The concentrate business that is a vital part of the San Joaquin Valley and membership of Allied Grape Growers.

- For those growers who deliver to the concentrate processors, we need to help them grow more tonnage, higher sugar at lower costs of production and earlier harvest.
- We need to help in the development of California-based grape juice products sold at retail and into the government food programs.

Second: The production of good quality winegrapes that allows the wineries to put out a product of superior quality. This will give us a competitive product edge for both exporting and against imports — at a competitive cost.

- We then need to help growers get better money for their grapes and continue to look at cost-saving practices.
- We need to help support programs to increase wine sales at all price points.
- We need to continue to help our growers maintain strong prices for the quality of grapes and wines produced.

Dorothy's three companions each needed something:

The Tin man needed a heart. But the California winegrape industry *already has* a heart. We love farming and providing a food product for our fellow Americans and the world. If we didn't already have heart, why would we still be here?

The Lion needed courage. Look around and tell me that the person next to you hasn't shown extreme courage by being a California farmer! Where else do you put your life savings at risk year after year? How much courage does it take to farm for 12 months, spending money on a crop that may not be sold, and the outlook for a price is disappointing for now and perhaps a couple more years? Some may call it crazy, but I believe you are all courageous farmers.

The Scarecrow needed a brain. Every year there are new challenges and yes, some opportunities. Now and for the next couple of years we will need to make intelligent decisions to get through this cycle. This may be one of the toughest periods for raisin and winegrape growers that we have ever faced. *It may last longer than we could have foreseen, but I do see light at the end of the tunnel.*

With the help of educational centers like University of California and California State University, Fresno, that are developing new and better viticultural practices, and organizations like California Association of Winegrape Growers, various grower/vintner organizations around California, Wine Vision, Wine Market Council, and the Allied staff, *we will get back home to Kansas.* Regrettably, some of our friends and neighbors may not get there with us.

There are no smoke and no mirrors in this presentation. I do not pretend to be the Wizard. There is no Yellow Brick Road to follow. But I am committed, along with the Allied Board of Directors and staff, to give you every opportunity and assistance to wake up from this dream and return home to better times.

We will continue our path of hard work along with the commitment and support from our winery partners. ■

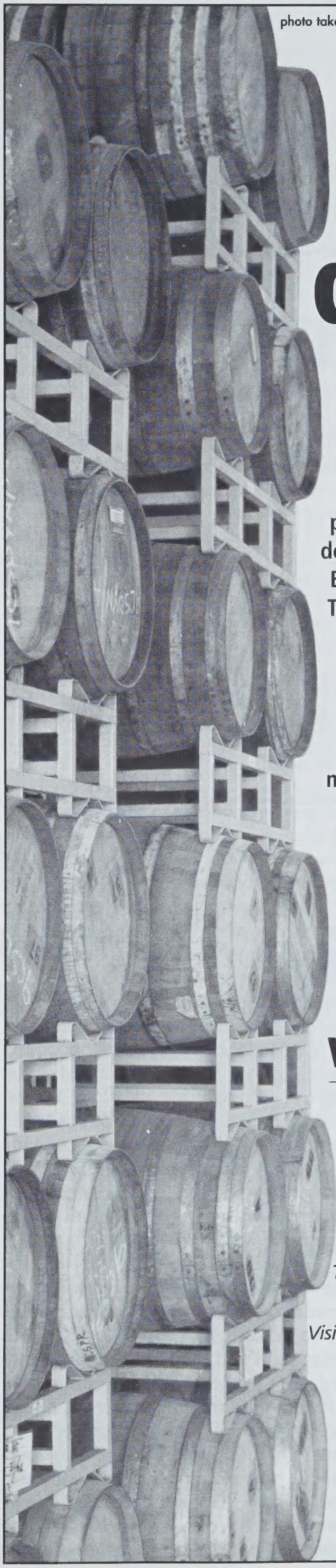

photo taken at St. Francis Winery

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Grape bunch exposure and aroma development

BY Dr. Erika Winter,
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Aromas in wines are good for us. It has recently been shown that wine aromas (compared to a simple solution of ethyl alcohol) positively stimulate human brain waves.[1] Normally, we sense aromas, either when we smell wine or when aroma molecules travel up the back of the nose from the mouth.

Wine flavor is composed of taste, mouthfeel, and aroma. Aroma molecules are mostly very small, and they work in extremely low quantities. For example, the concentration of a compound that produces a grassy aroma in white grapes is generally in the range of 8 to 20 ng/L.[2] This is like eight berries in a million tons of grapes!

In the grapes, major aromas or their precursors are present in the order of 10 to 6,000 µg/kg fresh weight. Such small amounts have implications with respect to management during bunch development as well as during transport, crushing, and winemaking.

Each variety has a certain spectrum of aromas that coexist in berries.[3] Often five to 20 aromas are sufficient to characterize a variety. The combination of aromas changes during the ripening process.[4] In general, grassy aromas predominate early. Floral, fruity or spicy aromas evolve later in the ripening process. This evolution is not directly related to sugar accumulation.[5] However, changes in aroma follow the general course of berry development.

Many (but not all) varietal aromas are chemically-bound and odorless in the grapes. They may be transformed into their aroma-active form during the winemaking process or during storage. Grapes can release some aromas with the help of their own enzymes. Human saliva also has these enzymes (to differing degrees). Strong heat, acidity, UV light, or bacterial and fungal attack can also liberate aromas.

For most wine styles, it is important for grapegrowers to maximize the level of aromas in the grapes — and not to lose many from heat, UV light or *Botrytis* before they reach the fermentor.

High levels of aroma development are only possible if certain prerequisites are met. Vines need the right amount of nutrients, water, and light to sustain the trunks and roots and to produce a high quality crop with full aroma potential.

Vine balance is essential for aroma development. Balance is defined as the relative proportions of crop, leaves, and perennial structure (such as trunk and roots).[6] Growers can assess vine balance by the appropriate proportion of mature, exposed leaf surface to fruit weight, which may be different in different sites and climates.

Temperature and light determine the activity of enzymes important for aroma formation and aroma retention. In contrast to color formation,[3] optimum light and temperature ranges are not yet fully determined for aromas.

Many recommendations on bunch exposure come from cool climates with low light intensities. Most of the experiments concerning bunch exposure and aroma development described below were done in cool climates at moderate temperatures and with general summer light intensities of about 1,000 to 1,500 PAR (photosynthetically active radiation units). It would be of great interest to study the effect of many cloudless days of >2000 PAR and temperatures above 30ºC on dynamics and extent of aroma development.

Different aromas have differing requirements for light and temperature. From the characteristics of some selected aroma molecules discussed below, it may become obvious that, for each climate and each wine style, special care is required to provide optimum bunch light and temperature conditions to ensure aroma formation and preservation.

Grassy aromas from methoxypyrazines

The family of methoxypyrazines (MPs) has capsicum-herbaceous-gooseberry aromas. MPs are present in green plant parts, including green berries, and are thought to act as insect deterrents. In the berries they decrease naturally after veraison. The decrease is closely related to the decrease in malic acid.[7] The rate of decrease is determined by the amount of berry exposure. The more shade is provided over bunches, the less MPs disappear from the berries.[7]

Viticulture for aromas from methoxypyrazines

If these aromas are sought, there is an option of earlier harvest or partial leaf cover of the bunches — or both. Earlier picking may be a disadvantage if the aroma is intended to be accompanied by floral and fruity notes. If too much grassy aroma is detected, more exposed bunches or later harvest should be recommended.

Floral and citrus aromas

Molecules of the monoterpene family cause the abundant floral and citrus aromas. They may act in the grape, as in other plants, as bactericides and pesticides, and they are chemically-bound to one or two sugar molecules.[8] In the bound form, they are not volatile and have no aroma. In this form they are known as potentially volatile terpenes (PVTs).

The sugar bond can be released in grapes through the activity of grape enzymes during ripening or in response to heat and pest attack. The resulting intensely aromatic free volatile terpenes (FVTs) can sometimes be smelled at the surface of berries. The release of FVT is inhibited in musts by the high level of sugar that is present. Commercially available glycosidase enzymes can induce the release of these aromas.

Directly measuring the amounts of the monoterpene compounds in grapes requires specialized laboratory staff and equipment, but juice and berry testing are easier for monoterpenes than for other aromas.

Berries produce monoterpenes only in the presence of enough light and warmth;[4] thus leaf removal is a common practice to enhance monoterpene levels in cool, cloudy climates. However, data from Canadian trials showed that, even in cool climates, there is a fine line between exposure and overexposure — increased row width in vines with leaves removed, and thus longer bunch exposure, led to a decrease in monoterpene aromas compared to narrow spaced-vines with leaves removed in front of the bunch zone.[9]

A lack of PVT concentrations in berries at harvest can be the result of a slow formation of the molecules, if optimal temperature or light conditions are not met. Alternatively, the cause may be a poor preservation of molecules, if there is high pest incidence, high heat load, or perhaps some destruction by UV light.

It is now possible to distinguish the effects of light and heat on aroma formation in berries with devices designed to cool exposed and heat-shaded berries.[10] Further studies are needed. The following section draws on existing international research.

Light and heat

There is some evidence of the sensitivity of monoterpenes to high light and heat from a vineyard study in the Loire region of France. In the Melon variety, monoterpenes from exposed bunches in a hotter and sunnier than normal year were not higher at harvest than those from bunches in dappled light.[11] This could be interpreted as due to a loss from exposed bunches as well as stimulation by higher-than-usual light in bunches under leaf cover. In a cooler year, sun exposure was beneficial — it doubled monoterpenes.

In a Shiraz trial in Languedoc, a warmer climate than the Loire, bunches in full sun had only 30% more monoterpenes than bunches that were put in paper bags after véraison (approximately 2% of max. radiation).[12]

In another trial, the concentration of monoterpenes at harvest was almost twice as high in a mild year compared to a hot year.[13] The difference between light-exposed berries and those which were shaded from 4 mm diameter onwards were higher in a cool year, when the berries had higher acidity and lower sugar levels.

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In the Okanagan Valley in Canada, leaf plucking in front of Gewurztraminer bunches was an advantage for monoterpene formation in all sites through all five years of study. However, cooler years resulted in overall higher PVTs.[14] Temperature differences between years had stronger effects on sensory attributes of wine than canopy manipulations and trellis forms.

In northern Italy, vintage and site comparisons of Muller-Thurgau musts and wine revealed that free linalool concentrations (which are typically a small proportion of the total linalool) were highest in hotter regions, higher altitudes, and in unventilated situations (pergolas and nets), which may point to a lack of stability in such settings.[15] However, bound linalool levels were more concentrated where it was cooler; they were unaffected by altitude and netting and were higher in Guyot than pergola situations.

Interestingly, in a hot year, at 800 m elevation, aluminium sheets on the vineyard floor resulted in lower free and bound linalool concentrations at similar sugar content than found in the musts from vines grown without the sheets. Furthermore, in all five clones investigated, the sum of floral aromas was higher in cooler vintages, determined by the Huglin-Index (= mean + max daily temperature/2, corrected by latitude).

Crop removal

With Shiraz in the Montpellier region of France, reducing bunch numbers after berry set from two per shoot to one improved PVTs at harvest by 30%.[13] The higher leaf/fruit ratio after the crop thinning also increased speed of ripening and final sugar concentration in the berries.

Harvest timing

Under cool Canadian conditions, late harvest resulted in higher amounts of Gewurztraminer monoterpenes compared to early harvest.[14] In the Loire area when conditions cooled late in the season, Melon berries were able to make and retain new PVTs.[11] In a Trentino Chardonnay, late harvest was only beneficial in a cool year, and in an Italian Muller-Thurgau in 1998, only bound linalool increased with a late picking.[15]

Viticulture for floral and citrus aromas

Trellis forms and manipulations that ensure moderate bunch temperatures during as many hours of the day as possible all year long favor monoterpene formation. Temperature measurements in the fruit zone can be used to fine-tune activities with respect to the amount of leaf plucking and shading required for each site.

A balance between minimum light requirements and avoiding summer midday heat loads is important. Monoterpene concentrations are not directly related to sugar concentration and yield alone.[11,13,14,15] However, a sub-optimal leaf/fruit ratio seems to prevent maximum monoter-

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An Open Letter to Growers Struggling with Phylloxera

Healing phylloxerated vines to make them beautiful and fully productive again has now become **easy**. A sustainable soils program was developed in New Zealand six years ago that fully restores even severely phylloxerated vineyards to full health and quality fruit production.

We have begun to publicize this news in the U.S. because the program has consistently worked in all commercial vineyards in New Zealand and Australia where it has been applied and because it works in U.S. soils as well.

Being affiliated with the innovators since 1997, we imported and tested this same program on California vineyards in Madera, Amador, and Santa Clara counties and the Lodi-Woodbridge district. The dramatic results are equal to what satisfied growers in New Zealand have come to expect. California vineyard owners are amazed and delighted with how visibly their vineyards are recovering in just one season! We are now offering the program to you.

HOW IT WORKS

This program works because it successfully puts into practice the principles of soil ecology known as "the soil foodweb" that were researched at universities. These principles are now endorsed by the U.S. Department of Agriculture and Natural Resources Conservation Service (NRCs) as published in the *Soil Biology Primer* (2000).

The sustainable soils program was developed by a New Zealand company networking with scientists and viticulturists in the premiere wine grape districts of New Zealand. Treated vines make a big recovery the first season that is exciting to watch.

The materials used are natural and non-toxic and make critical shifts in the root zone. The program restores root function rather than killing the pest. Vines rapidly come back to healthy canopy and crop. This program heals dying vines and protects healthy vines and makes phylloxera irrelevant. It works!

What this means to you is that a scientific program for reliably healing your vineyard in a sustainable way is now available that gives you an outstanding alternative to replanting. What this ***really*** means to you is that you can get your vineyards back and make them beautiful with an advanced program that puts phylloxera in the past!

A full presentation about this program can be seen on our web site at ***www.soilweb.com***. If you are struggling with phylloxera, or see that phylloxera is getting started, contact us for full information on this state-of-the-art program. Contact us now by phone at 408/846-1632, or by email at ***info@soilweb.com***.

Sincerely,

Jim Barlow
President, **Soilweb, Inc.**, Cal-Poly graduate in Fruit Science, 1974

P.S. Be sure to ask for the free video documenting the history and results of this soils program in the Marlborough District of the South Island of New Zealand. Contact us at the phone number or email address above.

P.P.S. If you know someone else struggling with phylloxera, pass this letter along and good things will happen!

pene formation. Vine balance assessments and adjustments may offer solutions other than sacrificing crop.

Other fruity aromas

These are mainly composed of other terpenoids, alcohols and esters, and various sulfur-containing compounds.

Norisoprenoids

These terpenoid aromas are produced in the berries from carotenoids, which are made before véraison in the plastids. The major proportion in the berry is sugar-bound and odorless. In grapes, no enzymes were found that could release them, but fungal organisms can set them free.[4] The norisoprenoids damascenone and beta-ionone have tropical fruit and violet aromas respectively, which become apparent during the winemaking process.

Norisoprenoids and bunch exposure

Light during early ripening, provided it contains the blue-green part of the spectrum, increases carotenoid contents and thus norisoprenoid potential.[16]

Reflective aluminium foil placed on the ground in a Shiraz vineyard trial in Southern France increased carotenoids before véraison by reflection of light and/or heat.[17] Grapes from these treatments produced wines with superior aroma intensity. Norisoprenoid concentrations were lower in the absence of light both before — and in particular after — véraison.

Light was also observed to accelerate carotenoid breakdown and formation of norisoprenoids in Riesling,[18] Shiraz,[13] and Melon.[11] In the latter study, norisoprenoid concentrations at harvest in both light and shade were less in the hotter year than in the moderate years. In the hot year, when conditions became cooler, the norisoprenoids increased again. This may point to a sensitivity of norisoprenoids to heat or light.

In Italian high altitude (650 m) Chardonnay, damascenone concentration was higher in the cooler year and when picked later. However, the difference was not as marked as it was in monoterpenes.[15]

UV exposure during ripening led to lower damascenone contents in a Geisenheim study comparing sun-exposed to plastic-shielded Riesling fruit.[19]

Norisoprenoids and crop removal

Improving leaf to shoot ratio by partial crop removal after berry set does not increase this aroma in the remaining crop.[13]

Sulfur-containing aromas

Several sulfur-containing compounds add pleasant fruity and pineapple notes (such as mercaptopentanones) to the array of aromas in wine. In grapes, they are bound to cysteine, and are not set free by commercial enzyme additions in juice testing. They become deactivated if copper is

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present in fermentation either from late fungicide sprays on bunches or from winemaking practices.[4]

Denis Dubourdieu and his group in Bordeaux are currently investigating the influence of growing conditions on these aromas in white and red wines. Sulfur-containing black currant aromas in wine, however, are formed by the yeasts from amino acids during fermentation.

Alcohols and esters

The most complex group of fruity aromas is that of berry-fruit alcohols and esters. Not much is known about bunch exposure related to the development and balance of these aromas in a maturing grape. Dappled light was beneficial for the preservation of these aromas.[11] Alain Razungles and his group in Montpellier are investigating these issues.

Viticulture for fruity aromas

To increase norisoprenoid-based tropical or violet fruit aromas, light and warmth before véraison are important. After véraison, moderate light with low heat may be essential. Further work is needed, particularly relating to optimum heat and light after veraison for norisoprenoids and other fruity aromas.

Spicy and smoky aromas

Volatile phenolics and sesquiterpenes contribute to an array of smoky, spicy or peppery aromas. Aroma-active low molecular weight phenolics from grapes were found to be inversely related to sugar development and not directly related to other aromas and acidity.[11] In a French study, 75% crop removal only increased these aromas in Shiraz by 8%.[13]

Viticulture for spicy/smoky aromas

Further research on the effect of viticultural practices on spicy aromas is needed.

Interrelationships of aromas with other berry parameters

Recently reported principal component analysis of the effect of site on specific aroma compounds in Melon grapes of the Loire area (three years and five sites) showed that the glycosydically-bound monoterpenes, norisoprenoids, alcohols and other six-carbon aroma compounds are all negatively correlated to acidity at harvest.[11]

In a year with greater acid loss, aroma development was more intense than in a cool year with little acid loss, despite sufficient sugar development. Volatile phenolics were unrelated to other aromas and acidity and inversely related to sugar content and yield. Aromas were unrelated to sugar content and yield of reasonable dimensions (the latter two were found related to each other).

Viticulture and interrelationships of berry parameters

Avoiding excessive heat loads in berries through late season canopy manipulations may provide greater

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a cave.

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aroma for any given sugar concentration.

Acidity may be a better predictor for aroma development than sugar content; the development of major glycosylated floral and fruity aromas was found to be inversely correlated to acid concentration. Conversely, the decrease of grassy methoxypyrazine-derived aromas has been positively correlated with the loss of acidity.

As elevated temperatures, particularly at night, lead to quicker acid loss, it would be of interest to study the effect of some temperature-related management practices on aroma development, particularly in cool climate viticulture. ■

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References

1. Hirayasu, Y., Nagai, H., Nakamura, Y., Tanahashi, H., and Koga, Y. "Effects of wine aroma on relaxation using quantitative EEG analysis." *Am. J. Enol. & Vitic.* 52 (3), 283, 2001.
2. Allen, M.S., Lacey, M.J., and Boyd, S.J. "Methoxypyrazines of grapes and wines — differences of origin and behaviour." *Proceedings 9th Austr. Wine Ind. Tech. Conference*, 1995.
3. Iland, P., and Gago, P. *Australian Wine, from the vine to the glass.* Patrick Iland Wine Promotions, Adelaide, 1997.
4. Ribereau-Gayon, P., Glories, Y., Maujean, A., and Dubourdieu, D. *Handbook of Enology, Vol. II : The Chemistry of Wine.* Chapter 7: "Varietal Aroma." John Wiley & Sons, 2000.
5. Ribereau-Gayon, P., Dubourdieu, D. Donèche, B., and Lonvard, A. *Handbook of Enology*, Vol. I: *The Microbiology of Wine and Vinification.* Chapter 10: "The Grape and its Maturation." John Wiley & Sons, 2000.
6. Howell, S. "Sustainable grape productivity and the growth-yield relationship: a review." *Am. J. Enol. & Vitic.* 52 (3), 2001.
7. Roujou de Boubée, D., Van Leeuwen, C., and Dubourdieu, D. "Organoleptic impact of 2-Methoxy-3-isobutylpyrazine on red Bordeaux and Loire wines. Effect of environmental conditions on concentrations in grapes during ripening." *J. Agric. Food Chem.* 48, 4830–4834, 2000.
8. Wink, M. (Ed). "Functions of plant secondary metabolites and their exploitation in biotechnology." *Annual Plant Reviews* Vol. II, Sheffield Academic Press, 1999.
9. Reynolds, A.G., Wardle, D.A., and Naylor, A.P. "Impact of training system, vine spacing and basal leaf removal on Riesling. Vine performance, berry composition, canopy microclimate and vineyard labor requirements." *Am. J. Enol. & Vitic.* 47 (1) 63–76, 1996.

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Site-driven Oregon Pinot Noir

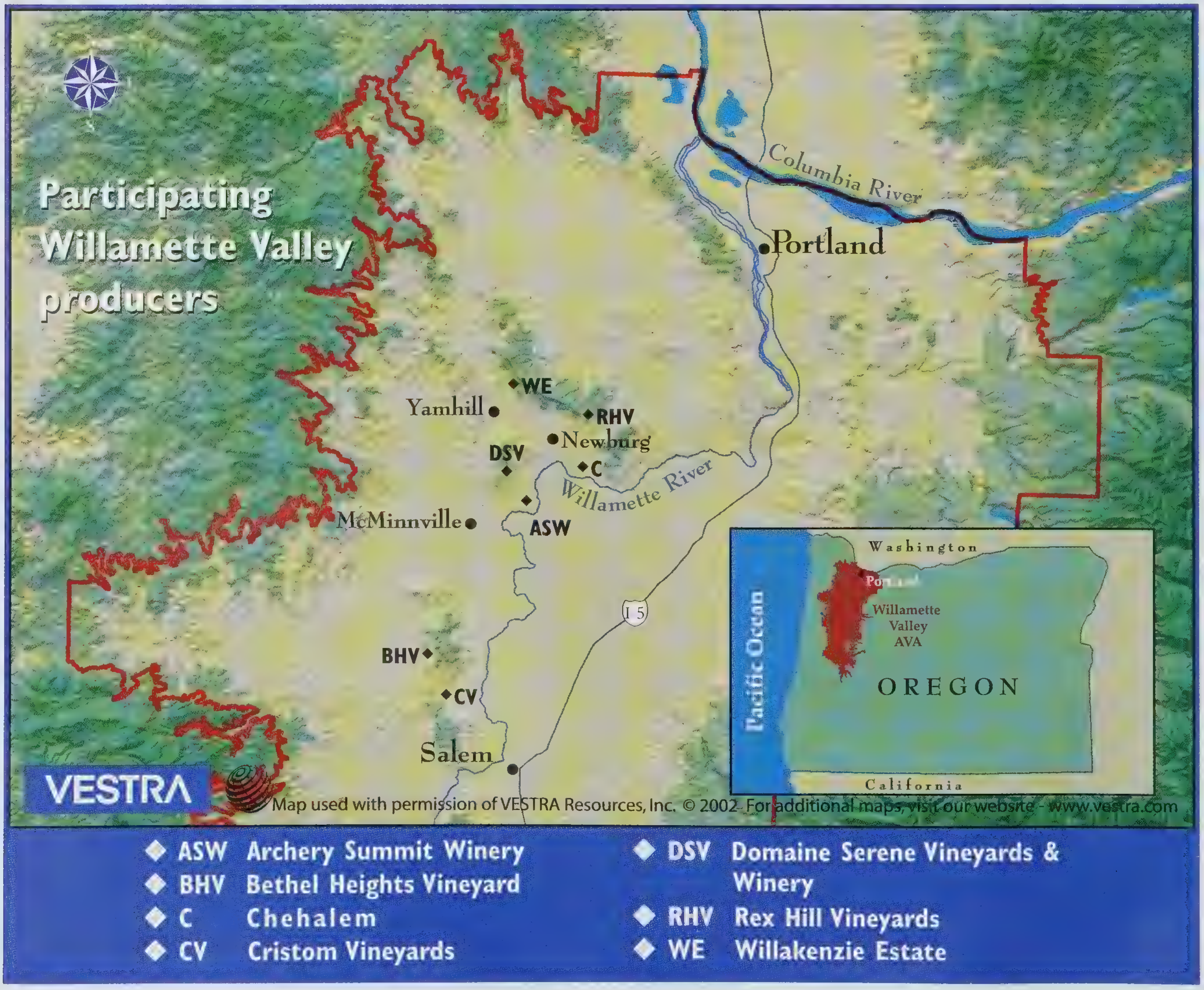
Multiple factors ramp up quality

BY **Eleanor & Ray Heald**
Contributing Editors

Words such as ***powerful*** and ***fruit-forward*** would appear to be in opposition to ***sensuous*** and ***graceful mouthfeel***. Add ***elegant tannins*** to a desired wine style that can be enjoyed in youth as well as rewarding those with patience, and you're on the wavelength of Oregon Pinot Noir producers.

Over the last decade, Oregon producers with newer vineyards have focused on high-density planting of different clones and clonal selections in combination with diverse rootstocks to create the best matches with soil profiles. In this varietal review, they discuss the progress of site-driven Pinot Noir, ratcheted up by clonal decisions and a multiplicity of other factors.

References to Oregon as a cool climate with highly variable vintages for Pinot Noir are outdated. Newer clonal and rootstock choices, coupled with a clearer understanding of site management for both old and new vineyards, have enhanced the potential to consistently achieve physiological maturity.



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Traditional clones

Dijon clones have not replaced the work horse Pommard and Wädenswil clones that put Oregon Pinot Noir on the wine map three decades ago. Warmer sites in cooler areas or conversely, cooler sites in warmer areas, now offer a broader spectrum of choices to achieve both ripeness and unique flavors.

Steve Doerner (Cristom) suggests that ripening potential depends on vine age and is independent of clonal material. Due to a shallower root structure, younger vines ripen fruit earlier than older vines.

Leigh Bartholomew (Archery Summit) adds cluster size to a mix of considerations for clones or selections on a given site.

According to Terry Casteel (Bethel Heights), two Wädenswil clonal selections, both behaving differently, are planted in Oregon. UCD-1A and UCD-2A show the greatest disparity. UCD-1A, planted at Bethel Heights, tends to ripen later; sometimes as long as 10 days after Pommard. It's fruitful, requires crop monitoring, and produces a dark wine, often with significant acidity.

Generally, 2A, planted at Chehalem, ripens before Pommard and yields a more floral, lighter-bodied, more linear, and less fleshy-fruited wine.

Casteel references another clonal selection, extant from early Oregon plantings, called the "upright clone," or Gamay Beaujolais because its growing habits are similar. It can still be found in older Oregon vineyards.

Confounding the situation is the fact that Laurent Montalieu (WillaKenzie) finds the descriptions of 1A and 2A reversed. When these were planted years ago, not as much attention was paid to budwood sources.

"I don't believe," Montalieu contends, "that growers in Oregon can say they are 100% certain they know which of the Pommard or Wädenswil clonal selections they have planted. We are all adjusting our viticultural practices for the best yields, based on cluster weights and the way these selections are performing on particular sites. We are training them differently than the Dijon clones."

Training and trellising

UCD-1A at Bethel Heights, sourced from a California nursery, has large clusters. Phenolics in the wine are accentuated when clusters are over-exposed to the sun. Since its tendency is to grow a large vine, it has been retrofitted from Geneva Double Curtain (GDC) to vertical shoot position (VSP) to better control light on the clusters.

For UCD-2A and Pommard at Chehalem, Harry Peterson-Nedry also chooses VSP trellising. He notices some, but not radical, performance differences between the two selections in the same block, side by side. Cheryl Francis notes that UCD-2A ripens a few days ahead of Pommard.

On one Rex Hill site, where the soil is very fertile, vines want to crop heavier. There, 2A is on a Scott-Henry trellis, and on another site that is less vigorous, it is on VSP. In selecting the best training method, Aron Hess (Rex Hill) suggests that the overriding factor is site selection, rather than clonal differences.

On one Archery Summit site, Pommard, 2A, and Dijon Clone 115 on 3309 rootstock are planted (close spacing) next to each other, and are trained exactly the same. All three clones behave differently.

Multiple clones, in Montalieu's opinion, offer Oregon producers aroma and flavor complexity. Yet, within the same mode of training (which includes spacing), viticultural practices must be adjusted to the particular clone or selection to achieve the maximum each has to offer.

Ten different clones are planted at WillaKenzie. Each block, or particular combination of rootstock and clone, is adjusted to what the final aroma and flavor goal is for the block. Once a vineyard begins to produce, it takes fine-tuning to achieve desired results.

If only one clone is planted, aroma and flavor diversity can be achieved by soil differences within a vineyard. Yet the vineyard is not the only variable available to make high-quality Pinot Noir. "Diversity," says Peterson-Nedry, "is a tool to gain complexity. Achieving complexity is always a goal of great winemaking. Clonal diversity is only one tool to gain it."

In Doerner's opinion, diversity has also been advanced by newer clonal selection availability, more rootstocks, and modern training and trellising.

Vineyard expressions

Because Pinot Noir mutates, Sam Tannahill suggests this is the reason there are so many different expressions of what may have started as the same plant material. In a 20-year-old vineyard that may have been planted originally to Pommard, different sections of the vineyard illustrate clonal behavior differently, as the vines have adapted to a particular soil type.

If budwood from this vineyard was planted today, the vineyard would have plant material that's genetically Pommard but not necessarily with the same traits as the original planting.

"There's also complexity and elegance gained from 20-plus years," says Peterson-Nedry. "This can't be discounted."

Do young vines exhibit a sense of place like old vines do?

Tony Rynders (Domaine Serene) believes they do. Within one vineyard he works with, there are multiple aspects, different clonal and rootstock interactions, and each block produces a different wine. "Part of what makes the wines different," he says, "is the expression of where the vines are planted."

Tannahill, who uses the term *terroir* to express his ideas, further defines the term. "If *terroir* includes climate, then a part of the vineyard that's warmer will ripen earlier regardless of vine age."

Doerner rejects a yes or no answer to the question of vine age and *terroir*. Obviously, he says, there will be some

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terroir expression when vines are young, but there's more as vines age and the root system establishes to find subsoil conditions. When vines are young, it's almost like growing potted garden flowers, where viticultural efforts only affect the soil a few inches deep. As roots extend deeper into subsoils, the vine becomes more expressive of the site and less expressive of the clone itself.

Hess does not agree wholeheartedly. He describes a young Rex Hill site from which wine was first made in 1998. It's planted to clones UCD-23 and Dijon 115. "There's definitely a common thread," he reports, "between both the clones and various blocks."

Casteel does not wish to dismiss this, yet believes the issue is that *terroir* includes more than a young vine can access in only a few years.

Different observations, according to Montalieu, are related to soil types. Two years ago, many holes were dug throughout the WillaKenzie vineyards. He was amazed that even with three-year-old vines, roots had grown down five feet.

"Clonal diversity is essential when the vines are young," Doerner adds. "But as Pinot Noir mutates and adapts to soil type over time, it is less important. With age, the vine is more expressive of site. And what's more amazing with Pinot Noir is that even in the same soil profile, they mutate differently."

Elevation

In Montalieu's opinion, it's too early to assess the impact of elevation on clonal expression. So far, young vines show differences in maturity at lower elevations, where they ripen sooner. "But at WillaKenzie, there's so much planting diversity between clones and rootstocks that we can't say what takes precedence: altitude, clone, rootstock, or soil.

"Today, there's insufficient research being done. Due to vineyard replanting in California in the early 1990s, there was little rootstock choice. We took what was available. Now there are more choices, but vineyard owners must conduct their own experiments. If after 15 years, the clone matched to the rootstock or soil proves unsatisfactory, is a grower likely to rip out the vineyard? No, a way must be found to work with the planted combination and make adjustments to balance the vine for maximum flavors."

On some sites, Rynders believes that vigor control is affected by rootstock selection, although soils, slope aspect, and clones all play a part in vine growth.

Irrigation as a tool

A general issue that irrigation influences is when grapes ripen. Doerner believes long hang-time is critical, and irrigation is the tool that allows walking the fine line with more security. "Irrigation," he says, "can delay ripening, which is good in dry or hot years. We're looking to maintain stressed yet healthy vines. Irrigation can optimize vineyard potential in a dry vintage."

Some participants work with unirrigated vineyards while others do not. Higher-density plantings of the last decade require drip irrigation.

When Bethel Heights vineyards were planted in the early 1980s, drip irrigation was employed for the purpose of developing the vineyard. In 1985, believing that the vines were established, use of the system was stopped. Casteel believes that line of thought has now come full circle.

With realization that Oregon has drought-like conditions during the summer, water management became a discussion issue in 1988, but the turnaround year, with consecutive days of hot summer temperatures, was 1992. Unirrigated vineyards produced some wines with over-ripe characters.

Now, for all its new vineyards, Bethel Heights is investing in an irrigation system. "Having an irrigation plan may mean watering for only a short time period," Casteel notes, "but we believe the investment is worth it, both for maintaining properly-stressed vines and growing superior fruit."

Tannahill cautions that mistakes can also be made with irrigation. He advises that it must be used as a tool.

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"It's a complex tool," adds Peterson-Nedry, "and should not be used like a hammer. I believe that very few people know enough about irrigation to use it totally accurately."

Rynders suggests, "Irrigation is an art form and can have a huge impact on the final product, either positive or negative. For our sites, we have adequate water holding capacity, so our vineyards receive no supplemental irrigation."

Monitoring irrigation is important to Montalieu. Initially, he used soil probes but has turned to the pressure bomb for greater accuracy in measuring leaf water potential. Utilizing pressure bomb readings, he believes vines can be maintained at desired stress levels.

Maturity indicators

"How much do harvest numbers really matter?" asks Tannahill. "Traditionally, we've used pH, TA, and Brix. Today, we've moved away from that to assessing flavors. What does that mean? It's different for every site and every block within a site. It means understanding the vineyards you work with.

"Other indicators accompany flavors, such as astringency, skin tannin, and ripeness of seeds (green, brown, or crunch easily). We're shifting to scientific analysis of phenolic maturity rather than a window for Brix, TA, and pH. Phenolic maturity can be measured visually, by the tongue, and by high performance liquid chromatography (HPLC). The latter is expensive but number analyses don't lie."

Doerner suggests that if one looks at all the wines in the world, Brix, TA, and pH are in a narrow range, yet some of the wine is great and some is poor. Hence Brix, TA, and pH are no longer reliable indicators of high quality. These are numbers that tell a winemaker only when to start walking the vineyards.

Francis stresses the visual aspect of seed and stem color as maturity factors not requiring scientific instrumentation. Another factor is the amount of color released when grape skins are chewed. At physiological maturity in some younger vineyards, berries have dimples and look like small golf balls.

Peterson-Nedry adds that the physical appearance of the berry also signals maturity in this order: turgid, unripe; softness, ripe; flaccid, overripe.

Montalieu believes it's important to judge maturity by intensity, rather than specific flavors. He indicates that judging this way provides a tool for a winemaker to better evaluate any vineyard.

Sustainable viticulture

Doerner describes Oregon as "sustainably ready."

Over the last decade, there's been a dramatic improvement in viticultural practices in Oregon. In the early 1990s, the goal was to get fruit picked before it rained. The aim now is more hang time, which is possible with improved vine training and better assessment of appropriate crop levels to attain maturity.

"We are in control now," Montalieu emphasizes. "We are not at the mercy of nature, except a catastrophic event. Two- or three-day rain events are no longer the problem they once were. Vines dry out and grapes continue development toward physiological maturity."

Recently, Archery Summit began to move toward organic growing. For Bartholomew that means paying more attention to what is going on in the vineyard, rather than following a textbook regimen of spray applications. Since Round-Up is no longer used, much attention is being paid to weed control. "But this tells me," she notes, "that the soil is alive, and I like to see that."

Montalieu believes that sustainable viticulture begins with paying attention to the life of the soil. "In Oregon," he says, "except for a few examples of the earliest vineyards that were sprayed, we are planting on virgin soil. The input of herbicides and pesticides is quite limited, which affords us the opportunity to achieve site expression."

Currently, Oregon producers interviewed feel no pressure to be affiliated with a sustainable viticultural or organic

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certifying organization. That said, it should be recognized that there is an organization in the state called LIVE (Low Impact Viticulture & Enology).

"The various standards don't match," Doerner comments. "There's no agreement on what's necessarily healthy or better, sustainable or organic."

Gravity processing

A pump has never been used at Archery Summit in any processing, grape to bottle. This is not the case with all producers interviewed, nor is it part of their winemaking philosophy. It's the Archery Summit belief that Pinot Noir is an extremely fragile grape making a fragile wine. Any mechanical manipulation reduces ultimate wine quality.

Doerner agrees, stating, "Less is better when handling Pinot Noir."

Tannahill adds that there may be instances when it's necessary to aerate a wine (which is not necessarily gentle handling) if it is either tannic or reduced.

Rynders believes there's a rate of diminishing returns with gravity, and that it coincides with the "life" of the wine. Gentle fruit processing with hand sorting, ability to destem or not use a must pump, and gravity filling of fermentors offers the greatest return on investment.

Tannahill cites the most fragile point in time of Pinot Noir in the cellar as just before bottling. "Avoiding the use of a pump at that point is important," he notes.

In Francis' opinion, filling barrels after fermentation, when the wine is saturated with CO_2 is a place where cutting corners on gentle handling (by using a pump) can be done with minimal negative effect.

Pre-fermentation practices

All producers use a varying percentage of whole clusters, and all opt for whole berries as much as possible.

Depending on berry size, WillaKenzie has three destemming cage/baskets with different hole sizes to choose from when destemming fruit.

One decision on first SO_2 addition involves uninoculated fermentation. In this case, the must cannot be left unprotected.

Doerner does not intentionally employ pre-fermentation maceration, but notes that it may take four to five days at ambient cellar temperature before fermentation actively begins. "Unless the fruit came in excessively warm," he says, "I don't chill the must down to 40º or 45ºF with dry ice."

On the other hand, Archery Summit, Domaine Serene, and WillaKenzie routinely drop must temperature through use of dry ice or refrigeration. Rynders prefers dry ice because it purges a major portion of O_2 and protects the fermentors during cold soak.

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At Archery Summit, dry ice is added to the top of the tank, five to seven times daily, to form a protective CO_2 layer.

Tannahill believes that lowering must temperature protects the fruit and prevents the start of fermentation. "In an open-top fermentor, grapes filled with sugar and nutrients have a significant infection potential. The risk is reduced by lower temperatures and a CO_2 layer."

Proponents of a cold pre-fermentation maceration believe it extracts water soluble anthocyanins, color, aromatic, and flavor compounds without extracting harsh tannins.

Casteel questions whether using dry ice pellets, especially if layered into the fermentor, may cause cell walls to rupture.

Montalieu believes that the pellets in contact with the skin cells may do this but that it enhances the ability of cellular components to be extracted.

Fermentation temperature

Among these producers, an average of 90ºF+ is peak fermentation temperature of the juice.

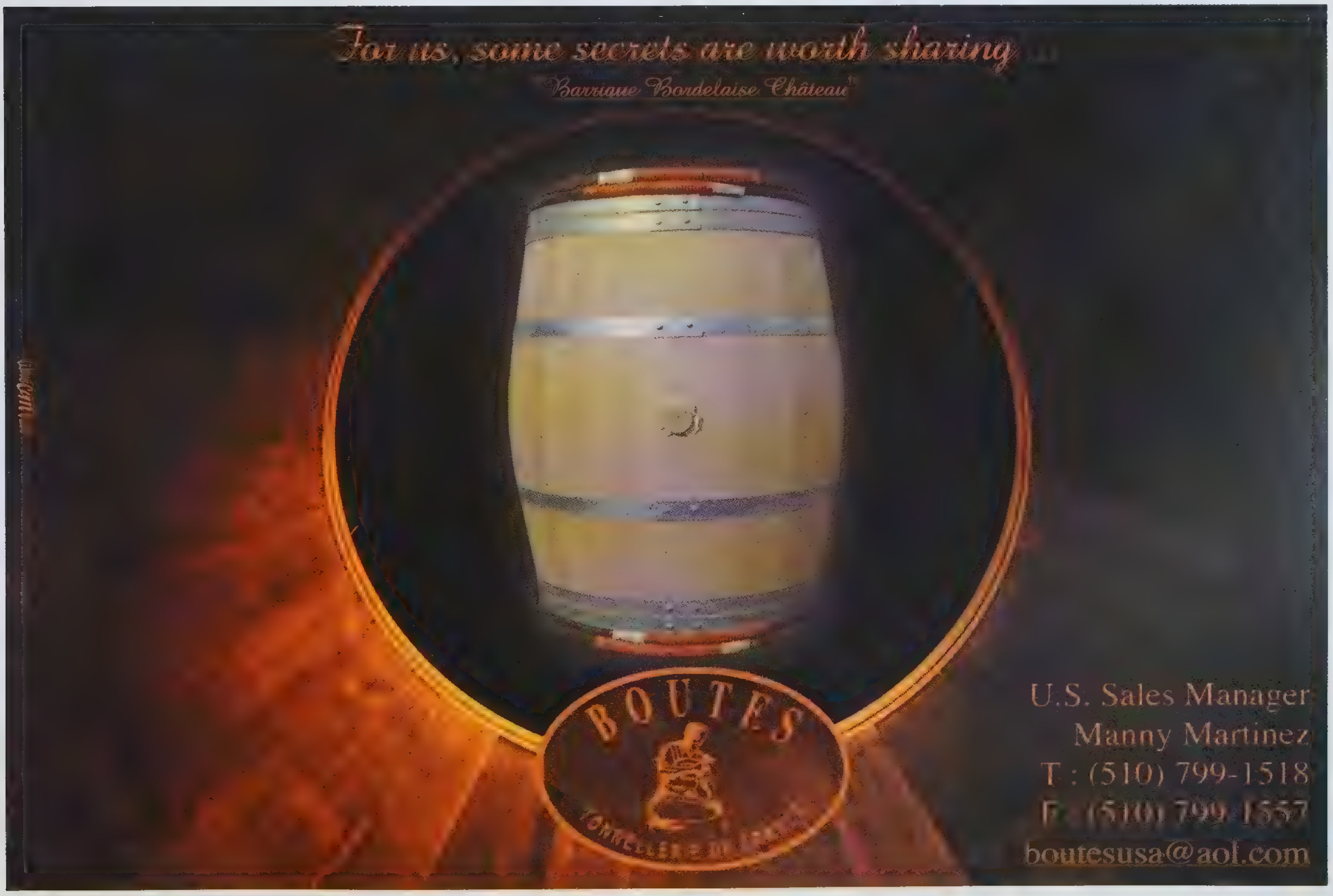
Although hotter fermentations may blow off some aromatics, Montalieu suggests that this consideration must be balanced with the benefits of greater extraction from the skins at higher temperatures.

At WillaKenzie, each fermentor has two refrigeration jackets, one to keep the juice itself cool, and an upper jacket to control temperature of the cap. Extraction from the cap is therefore achieved at a higher temperature. Six inches below the cap is where Montalieu measures fermentation temperature. "But," he remarks, "each winemaker has a different opinion about where it's best to make this measurement."

Ideally, winemakers want fermentation to proceed slowly. They suggest this is the best argument for uninoculated fermentation and fermenting some whole clusters.

Rynders maintains that another important consideration is the rate of evolution of volatile aromatics, even within a 5ºF window difference of maximum fermentation temperature. "Although red grapes seem to have a greater reserve, the nature of winemaking," he says, "is the release of volatile components, which are more readily volatilized at higher temperatures. For our program, peak fermentation temperatures of high 80s to low 90s are critical for extraction."

Although tannins are of less concern with Pinot Noir than Cabernet Sauvignon, Tannahill notes that some Oregon vintages, such as 2000, have more tannin than desirable for the Archery Summit style. Post-fermentation maceration for a short period to soften and round tannins is thus an effective technique. Tank by tank, however, tannin levels may be different.



Press wine

Hess explains that Rex Hill rarely adds back press wine. Press cuts are made based on tasting levels of phenolic extraction.

Montalieu's practice is the same as Rex Hill, and the bladder is inflated to no more than 1.5 bar. Because WillaKenzie production is small, the press wine volume after the cut is minimal, and it is discarded.

"It's very different from year to year," Hess adds. "Some years, we don't want to press beyond 1.2 bar."

Chehalem retains press cuts in barrels separately. "We actually do two press cuts," Francis explains. "The first cut gets transferred back to the main tank and then aged in barrels. A second cut, considered to have more structure, is aged separately."

Doerner, who presses to about 1.7 bar, blends press wine fractions together before transfer to barrel.

Barrel decisions

Participants agree that oak type, percentage of new barrels, and length of ageing in barrel are purely stylistic choices. Although they say they are experimenting with other oak types, participants' current choice is French oak, from 35% to 100% new, and for as long as 18 months.

"Pinot Noir is a variety that upholds oak better than any other red wine," Montalieu maintains. "Some of the richest Cabernets do not stand up to oak as well as Pinot Noir. Not being able to carry oak well is a Pinot Noir misconception."

Rynders adds that cooper, wood source, treatment (low to medium toast), and toasted heads (not used at Domaine Serene) also have an impact. "Every barrel is different," he notes. "It's to the point where a barrel discussion needs to focus on specifications, not simply on oak type or percentage new. Treatment of the barrels and cooper input far exceed the impact that forest plays in wine flavor."

Maximizing site reflections

Tannahill believes that minimizing winemaker intervention as much as possible maximizes the unique elements of a given site.

Doerner asks whether a high quality Pinot Noir must necessarily reflect a given site. He also believes each winemaker has his or her own opinion about what is minimal handling.

In the same vintage, several participating winemakers have taken fruit from the same source and made three very different wines. If this is the case, how can site specificity (*terroir*, if you will) be explained?

"To me," Montalieu maintains, "*terroir* is a sense of place. For estate-bottled wines, there is a person who belongs to that *terroir* [place]. It's very

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PROGRAM

DAY **1** (Monday) — ***Working with good soils***
REGISTRATION: 8–8:30 AM PRESENTATION: 8:30 AM – 12 PM and 1–5 PM
1) The "Ideal Soil" 2) Lime and Gypsum 3) Just N-P-K 4) Magnesium Only
5) Sulfur and Boron Considered 6) Traces to the Rescue

DAY **2** (Tuesday) — ***Building fertility on poor soils***
PRESENTATION: 8 AM – 12 PM and 1–5 PM with breaks
1) Light Sand 2) Extremely Heavy Soils 3) Excessive Magnesium 4) Low P and K
5) Needed Traces 6) Low pHs 7) Low Humus Content

DAY **3** (Wednesday) — ***Working with problem soils***
PRESENTATION: 8 AM – 12 PM and 1–5 PM with breaks
1) Excessive Calcium 2) Excessive P and K 3) Excessive Sodium 4) Low Iron
5) High pH 6) Very Low P and K 7) Too Much in Traces

important to include the winemaker in the concept. I believe it's the same for the term 'sustainable' as applied to viticulture. People who labor in the vineyard must be plugged into the concept."

Peterson-Nedry "hears" what Montalieu says, but notes: If Montalieu were to be replaced at WillaKenzie by another winemaker, the wines would have a different signature, which would not necessarily be a vineyard signature.

Bartholomew believes it's the same for a vineyard. "Each viticulturist, just as a winemaker, comes to a property," she explains, "with individual ideas about how to grow grapes for maximum flavors."

Hess adds, "What we're reacting to is Laurent's [Montalieu] definition. There are many differing opinions on the meaning of *terroir* and site-related characteristics."

Montalieu stands on his thought: "In any definition of site-driven characters in a wine, in this case Pinot Noir, the link between man and the dirt must be considered." ■

PWV thanks Willakenzie Estate Winery for hosting the discussion/tasting.

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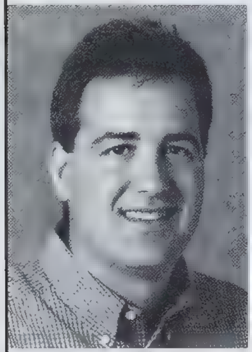
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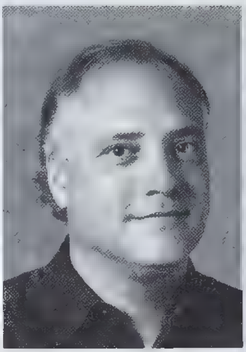
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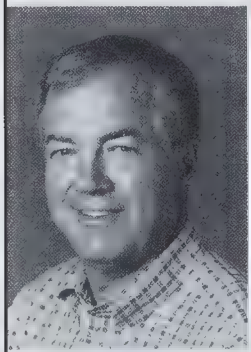
Greg Livengood, *California*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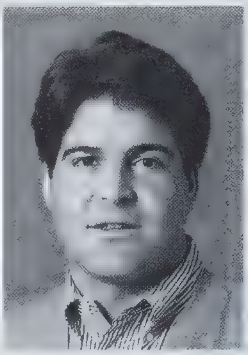
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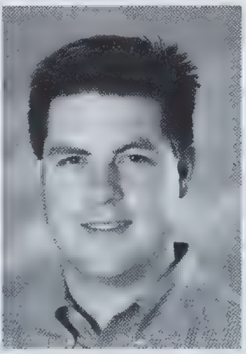
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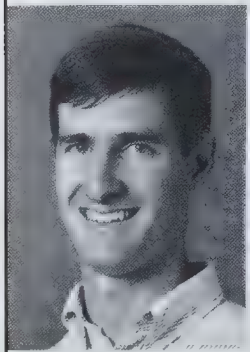
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WHERE THE INDUSTRY & INFORMATION CONNECT

2003 Unified Wine & Grape Symposium shaping up

Most attention in the winegrape industry has been focused on the 2002 harvest. But a group of 37 industry leaders has been hard at work arranging the 2003 Unified Wine & Grape Symposium. The symposium will be held at the Sacramento Convention Center in Sacramento, CA, on January 28–30.

The symposium continues to build on the success of previous years as it evolves to meet wine and grape industry needs. To that end, Paul Ginsburg has been chosen as program chair for the 2003 edition.

"We're pleased to have Paul Ginsburg, with his wine industry business perspective, serve as program chair," says Karen Ross, president of the California Association of Winegrape Growers, which co-hosts the Unified Symposium along with the American Society for Enology & Viticulture.

"Now more than ever, the Unified Wine & Grape Symposium needs to focus on the business and marketing elements of our industry," adds Ross. "As program chair, Ginsburg is providing leadership to assist us in identifying some of the topics that will enhance the industry's understanding of the global marketplace."

Ginsburg and the committee members have been working on a practical theme for the 2003 Symposium. "As always, we are focused on taking the best from the past while continuing to be progressive and doing things a bit differently," reports Ginsburg. "We will pay more attention to the business aspects of the industry, while on the viticulture and enology side, we'll include international developments to direct the Unified Symposium program toward what is currently taking place in the industry worldwide."

In addition to the general sessions, there will be sessions divided into four categories: Viticulture, Enology, Business and Finance, and Marketing/Public Relations/Sales.

Much of the program and many speakers are tentative. Based on initial discussions, likely topics are: sustainable winegrowing practices; irrigation management to improve quality; product packaging and production innovations; grape contract issues, and many more.

"A number of topics under consideration address production issues, such as wastewater management, which are not traditional technical viticulture or enology topics, but are key to the industry's long-term environmental sustainability and economic viability," notes Ross.

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One of the hot topics at the 2003 Symposium will be the current wine supply. "We need to discuss what to do with the abundance of grapes and of bulk wine and the impact they are having on growers and wineries," suggests Ginsburg. "It is a very different world this year. In previous years, everything was going straight up, but things are less certain now, and we need to focus on business, financing, and other alternatives."

Planned with the joint input of growers, vintners, and allied industry members, the Unified Symposium serves as a clearinghouse of information important to wine and grape industry professionals. The Symposium hosts the industry's largest trade show of its kind, with more than 550 vendors displaying products and services.

For additional information, please call 916-932-2244 or visit www.unifiedsymposium.org on the Internet. ■

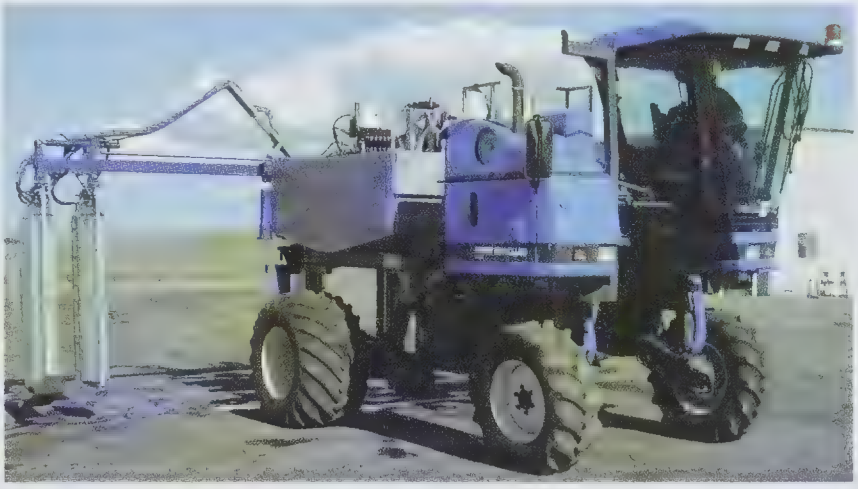
CLOSE-UP

Cross-Current Sprayer

Unknown in West Coast vineyards three years ago, the New Holland/Braud Cross-Current Sprayer attachment is now an increasingly important tool for grapegrowers. Twenty of the sprayer attachments have been sold for spraying in California vineyards, 10 of them in 2002.

Growers using the sprayer, report that the design makes the sprayer's coverage highly efficient by focusing the spray into the fruit zone, allowing growers to reduce the water volume.

The two- or three-row sprayer is built onto its own platform and readily mounts to the back of a Braud tool carrier (over-the-row harvester chassis). The Braud and a secondary system provide the hydraulics.



The cross-current three-row sprayer attaches to the back of the New Holland/Braud tool carrier. One of two tanks holding spray material and two of the vertical spray booms can be seen in this view.

For the past three years, Bill Hammond, Kendall-Jackson Monterey has used the sprayer on 300 acres of primarily Chardonnay (VSP trellis, spaced 8x6). "We use spray paper to fine-tune the unit and show excellent coverage, with smaller droplets penetrating into the canopy and covering the hard-to-reach nooks and crannies.

"All of the double nozzles on the fruit zone are positioned in opposite directions, only 18 inches from the foliage, to aid in coverage of difficult to reach areas around the fruit. This sprayer has allowed us to reduce the water volume, but improve the coverage, achieving more precise application, with sprayer speed averaging 3.5 to 4 mph.

"There are no limitations to material applications. Several materials do have minimum water requirements for application, which has not been an issue with the cross-current sprayer.

"We have high mildew pressure in Monterey County but have experienced good control, using the cross-current sprayer."

Due to the sprayer's efficient design, Euro-Machines, the sole U.S. distributor, and Braud, the manufacturer (owned by Case New Holland), expect an even greater interest in cross-current spraying equipment in the future. ■

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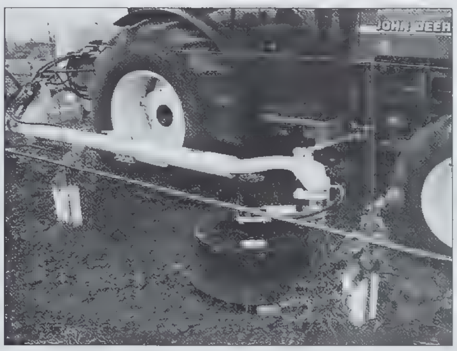

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FOCUS: PIERCE'S DISEASE

Struggling with PD in Temecula Valley

BY **Bo Simons**

The fight against Pierce's Disease (PD) in Temecula has benefitted the entire California wine industry. The scientific struggle to find information and solutions for the disease employs scores of researchers and millions of dollars all because the tiny (2,500-acre) grapegrowing community in Temecula mounted a conscious and concentrated effort to focus attention on the problem.

A look at Temecula vineyards

Driving east on Rancho California Road from Highway 15, one travels through about four miles of the boomtown known as Temecula, shiny new shopping malls alternating with crisp housing developments along a wide, pleasant thoroughfare. The sparkling new city ends abruptly at Butterfield Stage Road where Temecula wine country begins.

Temecula grapevines enjoy wider spacing than is common these days in North Coast vineyards. Some vertical trellising exists, but mostly there are lots of low, healthy vines in orderly rows among citrus groves. The sandy, tan-gray soil shows between widely spaced, lush, green vines. At mid-day, with the temperature in the mid-80s, and the air redolent of lemons, the atmosphere is serene Southern California wine country.

This does not appear to be the waste land one would expect from recent wine trade publication reports. Several reports said fall would be when the devastation wrought by Pierce's disease would be most evident.

Where were the massive symptoms predicted? You would expect mists of sharpshooter rain wafting out of citrus groves, and exposed trellises covered with decayed, withered vines, raisined grapes beneath chlorotic and necrotic red and yellow leaves, petioles bare of leaf blades, like skeletal fingers from lignified canes.

A closer look than just driving past vineyards shows that all is not well. There are skips, rows where one, five, seven, 10 vines, or a whole row are missing. Vines sporting scorched leaves, persistent petioles, and canes with uneven wood maturation mark Pierce's disease. Some of the enormity of the problem creeps upon you like a bad dream. The clean empty fields are not just unplanted land: they are former vineyards, ripped out.

Scars left by earth-moving equipment appear fresh upon the sandy earth. Mount Palomar Winery has the equipment pushing dirt around in the area between the winery and Rancho California Road, where both vines and citrus trees used to grow. Growers have become scrupulous about not retaining any infected vines. Pierce's disease spreads when a sharpshooter feeds on the infected vines and then spreads the bacterial pathogen *Xylella Fastidiosa* that causes the disease to healthy vines.

Nature and extent of the problem

Driving up the driveway to Callaway Coastal Winery and mounting the low hill the winery sits upon, the extent of the Pierce's disease damage becomes even more apparent. As you crest the hill, the hill beyond comes into view, where large skips are visible. To the east, whole blocks gape in silent witness where the vines have been ripped out.

Callaway's home vineyard is among the hardest hit. The devastation lies adjacent to the Callaway tasting room parking lot, right below Allie's at Callaway Winery restaurant.

Vineyard manager, Craig Weaver, has managed Callaway vineyard operations for 18 years. He has watched glassy-winged sharpshooters spread Pierce's disease, and he has since helped the winery reinvent itself.

Partly in reaction to the damage wrought by PD, Callaway Vineyards & Winery has become Callaway Coastal Winery. It now sources 50% of its grapes from Santa Barbara, San Luis Obispo, and Monterey counties.

Adjacent to the Callaway Winery are home vineyards that have sustained 40% damage: about 270 of the 675 acres of grapes are gone.

Several miles away from the home vineyard lies the Bell Vineyard, owned by Callaway. Its slightly resistant varietals and distance from citrus trees make it less prone to PD. Syrah vines on SO4 rootstock are surviving, along with Chardonnay on Riesling roots next to a lemon grove.

Vines at Callaway have almost all been budded over at least once. Varietals are grafted onto varietals: Merlot on Sauvignon Blanc, Chardonnay on White Riesling, Mourvédere on Sauvignon Blanc, Dolcetto on Chenin Blanc, Nebbiolo on Chenin Blanc, Chardonnay on White Riesling.

All these changed varietals reflect changes in the winery's marketing plans, not which varietals have the best resistance to Pierce's disease. The different varietals grafted onto varietals make for an interesting lesson. It is the original or base vine that is the critical factor. Chenin Blanc and White Riesling are among the most tolerant.

Where Merlot is grafted onto Sauvignon Blanc, the vines are hit pretty hard, not because of the Merlot, which is fairly resistant to PD, but because it is on Sauvignon Blanc roots, which are very susceptible. The three varietal combinations that have survived surprisingly well are Dolcetto on Chenin Blanc, Nebbiolo on Chenin Blanc, and Chardonnay on White Riesling.

The vulnerability of Sauvignon Blanc and Chardonnay has been difficult, since Temecula's reputation, and Callaway's even more so, began with white wine. Chardonnay and Sauvignon Blanc are among the most heavily planted varieties.

Temecula History

Temecula boasts a current population of nearly 70,000 up from only 2,700 just 30 years ago. The area owes its boom and, arguably even its wine industry to the developers of the planned community of Rancho California. In 1964, these developers, a partnership composed of Kaiser Aluminum and Chemical Corporation, Kaiser Industries, Inc., and Macco Realty Company of Corona del Mar bought the Vail Ranch for $21 million.

The Vail family had run a large cattle ranch carved out of the original Rancho Temecula Mexican Land Grant since 1904. The new partnership started a development that would become Rancho California.

A year before they sold to the developers, the Vail Ranch hired Richard Break, a former UC county agriculture advisor turned agricultural consultant, to do crop feasibility studies to determine how much of the property could be planted to citrus. Break discovered that that the ocean breeze that flows through the Rainbow Gap in the Santa Rosa Mountains makes for cooler temperatures than surrounding area and could sustain commercial viticulture.

Break was not the first to consider the area for growing wine grapes. He was following in the footsteps of Jean Louis Vignes, the man who was arguably California's first commercial winemaker. Vignes had seen the area's grapegrowing potential, and tried and failed to claim land there in 1856.

In 1965, the developers planted a demonstration vineyard with 57 grape varieties. Richard Break formed a partnership with investors from Fresno called "Temecula Ranchos," to carve out little gentleman farmer ranchettes with some grapes or citrus.

Brookside Winery started to put things on a commercial footing when it planted 350 acres of vineyard to supplant its lackluster holdings in neighboring Cucumonga in 1967. In 1968, Vincenzo Cilurzo, a television studio lighting designer, planted a vineyard on his 100-acre retirement estate.

Ely Callaway, president of Burlington Industries, bought 150 acres, planted grapes and started Callaway Vineyards in 1968. Callaway brought determination and an entrepreneurial flair to the area's grape and wine industry. Other vineyards and wineries followed. The fledgling Cilurzo and Callaway wineries were joined by Mt. Palomar, Maurice Carrie, and others.

The bedroom community boomed and the wine industry grew steadily. Callaway sold his winery to Hiram Walker in 1981, and went on to become the maker of Big Bertha, the world's best selling golf club. Temecula became an American Viticultural Area in 1984, following a heated discussion over the area's boundaries. Proponents of a larger American Viticultural Area won out.

The grapes, citrus, and housing all grew as the area boomed. Agricultural interests and the housing developers were sometimes at odds over whether subdivisions or Chardonnay would dominate the landscape. Agriculture won a round in 1989 when Riverside County set aside 5,000 acres on Buck Mesa as a Citrus and Vineyard Rural Policy Area until 2010. The Temecula area had struggled with its booming subdivisions and its attractive and growing wine industry, now coming to a workable if not totally placid agreement.

Fourteen wineries and 2,500 acres of grapes were there in 1996 when vineyard personnel started to notice a lot of unusual insects. The insects turned out to be glassy-winged sharpshooters that brought Pierce's disease. Less than 2,000 acres remain today. While the viability of the winegrowing community in Temecula remains in question, the alternative crop should grapes prove economically unfeasible is clear: houses.

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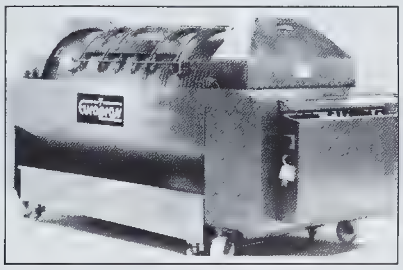

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Proximity to and type of citrus

Much of the research and speculation about the spread of Pierce's disease in the Temecula area focuses on the issue of proximity to citrus. The area is one of the few in California where commercial citrus and vines coexist. Glassy-winged sharpshooters tend to reach great numbers in the citrus, where they do little damage before moving out into adjacent vineyards where they wreak havoc.

Thomas M. Perring and others address this issue in a *California Agriculture* article (Perring, Thomas A.; Farrar, Charles A,; Blua, Matthew J. "Proximity to citrus influences Pierce's disease in Temecula Valley vineyards." July–August, 2001 Vol. 55. Number 4 Pages 13–18). Although they found some blocks of sharpshooters in the center of a vineyard and vines further from citrus more infected than those on the edge and close to the groves, generally their research indicates that infection "is most severe when the vines are adjacent to citrus, and that the damage declines as one moves away from citrus."

Weaver adds a further practical spin on the issue. Not all citrus is equal, or equally lovely to the insects that spread PD. Glassy-winged sharpshooters prefer grapefruit and lemons. They do not find oranges, tangerines, and other varieties nearly as desirable.

Weaver points to two vineyards recently planted next to citrus groves. One next to navel oranges thrives and shows no signs of PD. The other, next to lemons, has all the symptoms and will probably have to be pulled out. "It's the flushes," explains Weaver. "We think the glassy-winged sharpshooter (GWSS) likes the lemon and grapefruit because they experience more growth flushes per year. During a growth flush citrus trees put out tender new wood."

Citrus is definitely a factor in spreading the disease to vines. Glassy-winged sharpshooters, native to the Southeastern U.S., were first seen in California in 1989 in Ventura, where citrus is plentiful, but there is very little commercial viticulture. Glassy-winged sharpshooters were discovered in Temecula in 1996.

Admitting the problem, getting everyone involved

Once the wine growing community in Temecula realized the problem, they sought consensus among themselves. Being small in acres and numbers, helped. Once the grapegrowers and wineries were united, they sought cooperation from citrus growers.

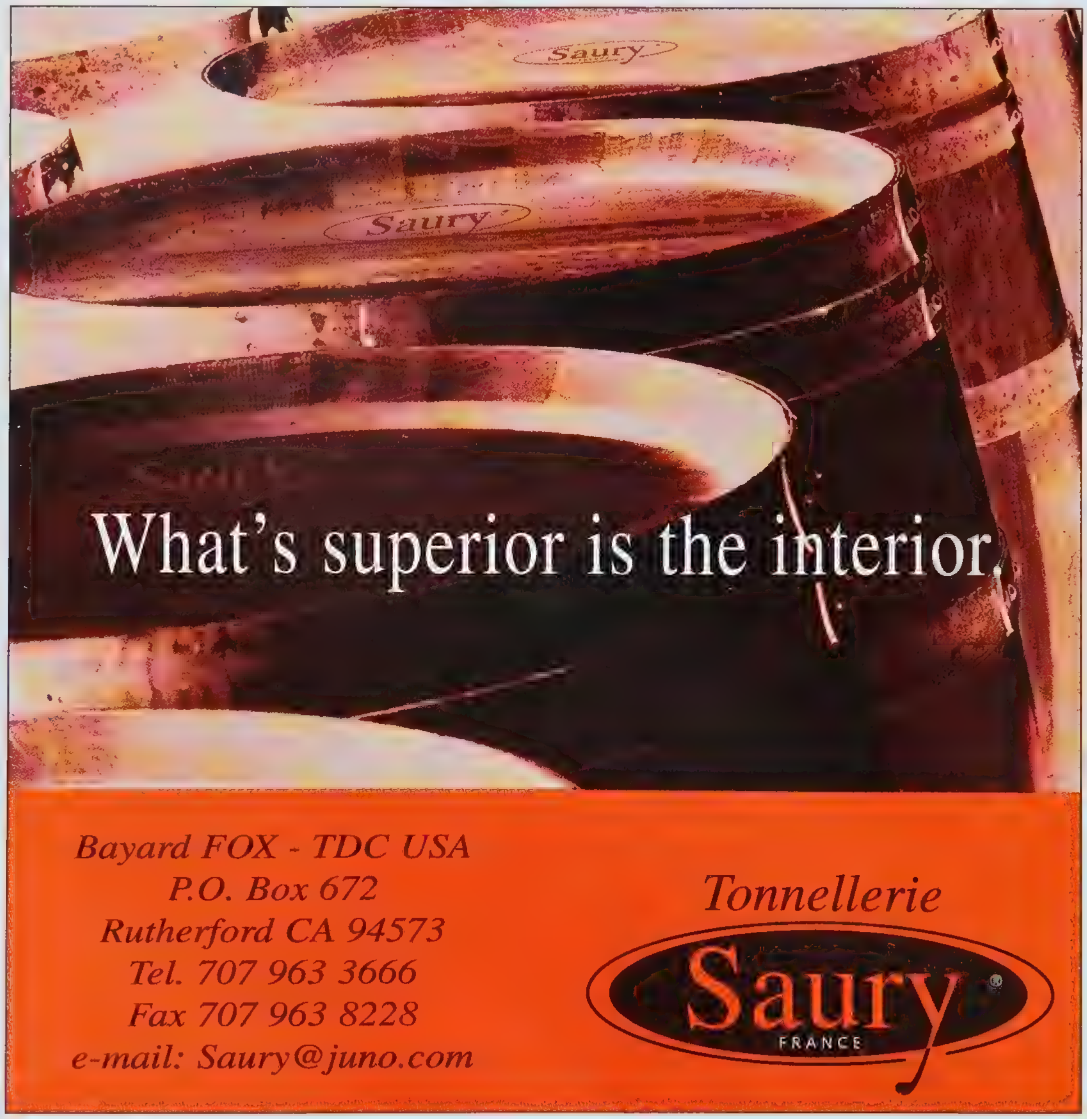
Weaver recalls Gary McMillan, who owns or manages much of the citrus in the Temecula area, including grapefruit on the northern perimeter of the Callaway home vineyard, offering to help. McMillan told Weaver, "Craig, I don't want to be considered the guy who didn't cooperate and help, thus leading to the demise of vineyards."

Weaver realized that was a crucial statement because McMillan had a well-established integrated pest management (IPM) program. Any new pesticide effort could possibly affect that program. McMillan was willing to allow irrigation of his citrus groves with one 32 oz. per acre application of Admire™ as part of the program to leave Imidacloprid to kill GWSS when feeding.

The wine industry grapegrowers in Temecula realized that they were fighting not only a scientific and economic battle to combat a disease with no known cure and not much research being done on it, but also a political battle to mobilize knowledge and support around California.

In March 1999, wine industry members asked the Temecula City Council for a $25,000 research grant. The city responded with $125,000 and the Riverside County Board of Supervisors matched the amount. The American Vineyard Foundation received a $250,000 research grant for the University of California (UC) at Riverside to explore options to control PD.

Three people emerged as part of the local leadership: Joan Sparkman, vice president of Temecula Valley Bank and



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a local civic leader, Weaver, and Ben Drake, an agriculturist who manages vineyards in the Temecula area but also farms citrus and avocados. They contacted the UC Cooperative Extension, FDA, UC Riverside, the Farm Bureau, supervisors, state legislators, and local congressmen.

Drake and Weaver credit Sparkman with making a difference in the political fight. "We were just two farmers who wanted a solution," recalls Weaver. "Sparkman had the connections and was not afraid to use them." She enlisted the aid of Riverside County Assemblyman Rod Pacheco, who was able to mobilize support in the State Assembly and obtain $750,000 for three years for research.

Because he grew both grapes and citrus, Drake served as a bridge between two communities, which had different interests. Weaver, Sparkman, Drake, and others in the community were instrumental in creating an awareness around the state that Pierce's disease and the GWSS posed a major threat to the grape and wine industry and the state's economy.

In August 1999, culminating years of behind-the-scenes work, California Department of Food and Agriculture (CDFA) secretary Bill Lyons completed appointment of the CDFA GWSS/PD Task Force. The task force met for the first time at Callaway, shortly thereafter. Legislators attended, including Senator David Kelley, Assembly members Rod Pacheco and Bruce Thompson, and representatives from agriculture committees of both houses and the offices of Senator Wes Chesbro, Senator Raymond Haynes, and Congressman Ken Calvert. Drake and Weaver are members of the task force.

Out of this meeting and countless others, the wine industry became aware of the problem and the legislature focused funds on research. It took Temecula growers a few years to learn that the huge infestation of bugs represented a new vector for an incurable disease, but through their efforts, the rest of the state was made well aware of the problem. A total of $10 million has since been funneled into research for a cure.

More money has recently been made available to pay grapegrowers for vine losses. In March 2002, the CDFA announced implementation of a Grapevine Loss Assistance Program. This program gives money to up to 370 grapegrowers in the four worst hit counties (Kern, Riverside, San Diego, and Ventura) to compensate for documented losses due to GWSS-spread Pierce's disease. Up to $7.14 million were made available for this program. Provisions of the program were contained in Assembly Bill 1242 authored by Assembly Member Patricia Wiggins (D-Santa Rosa).

Growers had to document up to 30% infection, the vine loss had to be due to Pierce's disease spread by GWSS after August 1999, and vines were removed by May 1, 2002. Vineyard replacement costs per acre were determined by each county. Vines over 10 years old when removed got a 3% deduction for each year beyond 10 years.

Getting infected wood out early

Early on in the fight, Professor Alexander Purcell (Division of Insect Biology, Department of Environmental Science at University of California, Berkeley) told Temecula growers that the best way to control PD was to remove infected vines. Leaving vines standing allows disease-free insects to become infected and thus spread the disease to other vines.

Temecula's willingness to pull out diseased vines early may prove to be its salvation. Weaver pulled out about 270 (40%) of Callaway's 670 acres in the Temecula area. Peter Poole at Mt. Palomar removed 30 of his 90 acres of vines.

Between 1999 and 2000, wine grape acreage in Riverside County decreased 17%. For white wine, the acreage decreased 22%.

Hitting trouble spots early and hard

Temecula growers were also willing to hit the vines and adjacent citrus with

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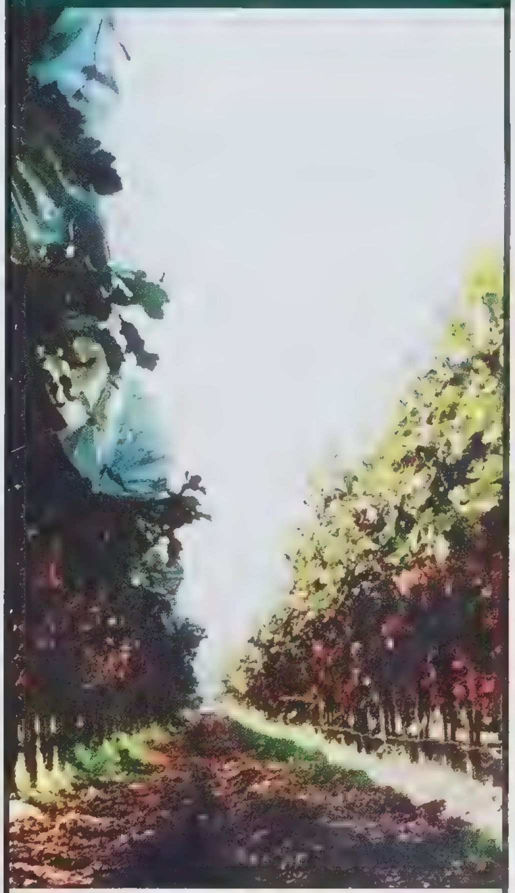

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insecticides. They felt they were in a war in which halfway measures would not work.

Early research suggested that a native parasitic wasp could make great strides against the GWSS by parasitizing the eggs, but the wasps will only be part of an integrated pest management solution for several reasons. At least four species of parasitic wasps, *Gonatocerus ashmeadi, G. triguttatus, Gonatocerus fasciatus,* and *G. morelli* have been studied in relation to knocking down GWSS.

Mark Hoddle, UC Riverside entomologist, reports that interest in *morelli* has waned, while interest in *triguttatus* has increased. At least two generations of sharpshooters are produced each year, a spring and a summer generation. Most of the wasps are effective on the second generation, but success depends on their effectiveness on the spring generation.

Several of the wasps were 98% to 100% effective on the summer generation, but somewhat less so on the spring generation. The *triguttatus* seems to be more effective on the spring generation and therefore holds more interest. Any IPM program including wasps accepts that some GWSS will remain, and a key is timing of chemical spraying to effectively manage them and keep insecticide use to a minimum.

A consensus decision was reached that the wasps alone were not the way to knock down the sharpshooters coming out of citrus groves. Winegrowers and citrus growers worked in concert with UC Riverside and the CDFA to develop a pilot program.

In 2000, part of a CDFA pilot program spent $360,000 to monitor and treat 1,600 acres of citrus in Temecula Valley. About 234 acres adjacent to vineyards were sprayed by helicopter with Lorsban, the trade name for a chemical called chlorpyrifos, a broad-spectrum organophosphate insecticide.

In 2001, $299,000 was spent for trapping and to apply Admire to citrus through irrigation. Helicopter spraying was done between 7:30 and 11AM on Saturdays when there was less than a five mph wind.

Admire™ insecticide was applied on citrus through the irrigation system. It is designed to kill young sharpshooters in the spring. In the vineyards, Provado, another insecticide, was used.

Prior to this massive effort, Temecula prided itself on a low input, sustainable approach to agriculture. Pesticide applications in 2000 have so reduced the GWSS population in Temecula that scientists now have to go to the Arvin/Bakersfield area to find sufficient bug populations to study.

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Conclusion

Drake, Weaver, and other Temecula growers have also helped mobilize a state into action. Because of the concerted calls-to-action of many in the Temecula area and the resulting response from the CDFA, University of California, the California Legislature, USDA, and the rest of the state, enormous brain power and research resources have been brought to bear on the Pierce's disease problem.

Everything from antibiotics to pesticides, from native parasitic wasps to sprays and oils are being tested. Because of the willingness to get rid of unhealthy vines, infection spread has been slowed. Because of a concerted spraying effort in 2000, the infestation of sharpshooters is significantly reduced. But it seems clear that, at least, Temecula Valley has a fighting chance.

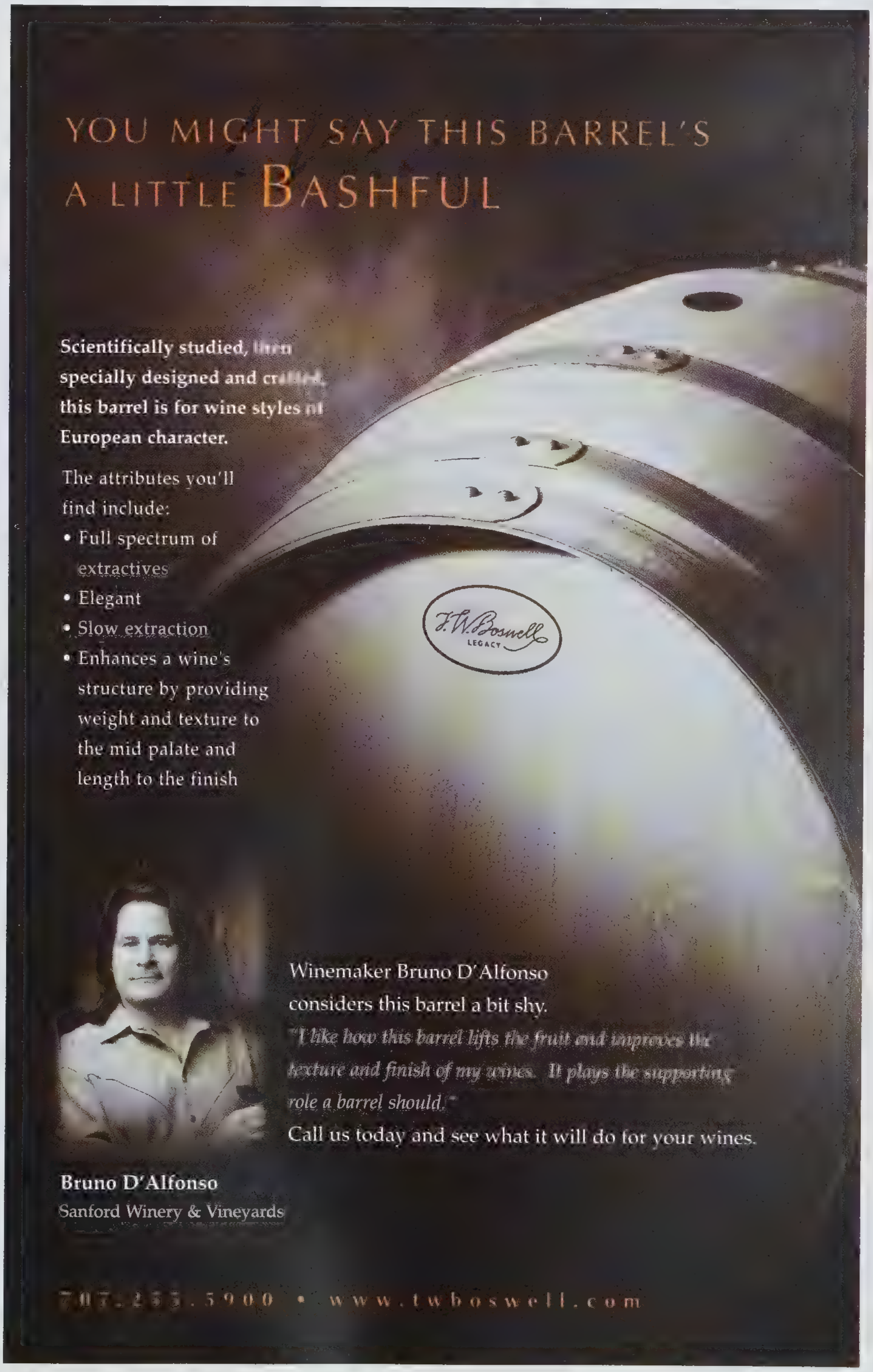
Drake has two vineyard trials to explore grapegrowing with PD. In March 2002, a new three-acre trial block of Syrah was planted with 110R rootstock. There was one irrigation at end of April with Admire™ added. Several vine rows received 16-oz. per acre plus a second application to deliver annual maximum of 32-oz. per year. Several vine rows received a total of 20-oz. of Admire™ per acre. Drake's goal is to have 4ppm residual of Admire™ in the xylem tissue that would kill sharpshooters if attacked.

Drake's second trial is one acre of five-year-old Cabernet Sauvignon on 110-R rootstock. There is a comparison/analysis of adding Admire™ or Platinum to irrigation water and an evaluation of application by drip from standard hose or with spaghetti extensions to deliver irrigation under mulch on the ground to insure delivery of material to the root zone in the soil.

Weaver has a seven-acre trial for badly damaged sections of the home vineyard adjacent to the Callaway parking lot. Callaway has planted to test five different treatments, with one control, in three irrigation blocks. Two rootstocks, 101-14 and 5BB, will be used with Clone 7 Cabernet Sauvignon spaced 8X8.

The five treatments include one trial with a balanced fertility program to see if PD can be successfully combated with fertilizers only.

One aspect of these trials that excites Weaver is that they involve a commercial vineyard, not a laboratory, greenhouse, or field station. Trials done in more controlled settings may get promising results, but those same results do not obtain outside a controlled environment, in the complicated and hectic reality of a commercial vineyard. ■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FOCUS: PIERCE'S DISEASE

Biological control of glassy-winged sharpshooters

BY Bo Simons

What is biological control?

Biological control is the use of natural enemies to reduce the damage caused by a pest population. Biological control practitioners note that their method differs from "natural control." Natural control occurs much of the time without human intervention as natural enemies keep populations of potential pests in check.

Biological control involves active human intervention, introducing new or increasing populations of a pest's enemies. These may include parasites, predators, and pathogens.

Biological control is often just one part of a total integrated pest management (IPM) solution to a pest situation. Additional control methods deployed in conjunction with biological control include chemical applications, usually in lower amounts and concentrations than without biological controls, cultural practices (soil management, pruning), hygienic practices, strategic timing of controls, and crop selection strategies.

Biological control success stories

Biological control is used with practically all citrus grown in Southern California. The industry was threatened back in the 1800s by cottony cushiony scale (*Icerya purchasi*), an insect native to Australia. In response, growers introduced a predatory insect, the vedalia beetle (*Rodolia cardinalis*), and the parasitic fly (*Cryptochaetum iceryae*), both from Australia.

Within a few years the cottony cushiony scale was completely controlled by these natural enemies. Today, the citrus industry controls another scale insect, red scale (*Aonidiella aurantii*), with assistance of parasitic wasps (*Aphytis melinus* and *Aphytis lingnanensis*) that lay their eggs on the insect.

Besides citrus, other biological control success stories include alfalfa and walnuts. The alfalfa weevil (*Hypera postica*) posed a serious threat to the forage industry in the northern U.S. until it was substantially reduced by the introduction of several natural enemies, including a parasitic wasp (*Bathyplectes curculionis*). Control of walnut aphid (*Chromaphis juglandicola*) involves another parasatic wasp (*Trioxys pallidus*) that lays its eggs within the walnut aphid.

Is there hope for biological control in managing GWSS?

"Not if your goal is to eradicate GWSS," replies Dr. David Morgan, the entomologist in charge of the California Department of Food &

Mass-rearing of parasitic wasps on single leaves containing glassy-wing sharpshooter eggs.

Tents used for mass-rearing parasitic wasps using whole plants containing glassy-wing sharpshooter eggs.

Agriculture's GWSS biological control effort in the six southernmost counties of California. "Biological control works best by reducing populations to lower levels, rarely by wiping them out completely. If the goal is to reduce populations, yes — it is working already."

Preliminary research undertaken by University of California, Riverside, indicates that egg parasitoids (insects that kill eggs by reproducing within them) can cause over 90% egg mortality from June through the remainder of the growing season.

"We hope that by introducing natural enemies early on in the season," notes Morgan, "we can achieve control earlier. Once this is accomplished, we hope to reduce our reliance on more aggressive control methods. In many ecosystems where insecticide use is limited (organic farms, urban, and wild land areas), biological control remains the most important control strategy available."

Are there existing parasitoids for GWSS in California?

"Native parasitoids of GWSS already exist in California," answers Morgan, "such as the closely related smoke-tree sharpshooter (*Homalodisca lacerta*). The most common parasitoid is *Gonatocerus ashmeadi*, followed by *Gonatocerus morrilli* in coastal areas. At least three other species are found at low levels."

Gonatocerus parasitoids are tiny stinger-less wasps. They lay their eggs within the eggs of sharpshooters. The developing *Gonatocerus* consume the contents of the sharpshooter eggs. What emerges from these parasitized eggs are adult *Gonatocerus* — not more sharpshooters.

What are their impacts on GWSS populations?

In most areas where it is established, GWSS produces two generations each year, in spring and summer. The eggs of the summer generation are largely killed by the parsitoids. The critical factor in combating GWSS with biological controls involves getting a parasitoid that can dramatically reduce the spring generation.

"*Gonatocerus* can successfully kill over 90% of eggs laid by GWSS," explains Morgan, "but only later on in the year."

Is part of the problem with some of the native wasps that they do not work very well with the early or spring generation?

"That's right," replies Morgan. "This is true of most biological control systems. There is frequently a lag between population change of the pest and the natural enemy. If you have a very good natural enemy, then that lag is closed pretty quickly.

"In many cases, by the time the natural enemy has built up its population, so has the pest, to such huge

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amounts that the enemy is never going to catch up with the pest. Even though we get a high level of control later on in the year, by the time that occurs, there are so many sharpshooters out there, even if you're killing 90% in the eggs with the wasps, that 10% you're not killing still represents a huge number of insects."

What is the status of explorations for other GWSS parasitoids?

Morgan describes the large coordinated effort: "Collaborators from university, state, and federal agencies from U.S. and have been searching and continue to search for natural enemies in the southeastern U.S. and Mexico where the GWSS is from.

"Populations of GWSS in its native area are less than 1/1000th of those found here, and we are keen to find the agents that suppress it. When in the area, we search for eggs of the sharpshooter or closely related insects. These are catalogued and returned to quarantine at University of California, Riverside. There, eggs are observed daily for emergence of egg parasitoids.

"Any emerging insects are offered fresh GWSS eggs to see whether they accept them as hosts. If they do, we rear them through at least three generations to ensure they are not carrying any diseases.

"During this time, we are able to accurately identify them by sending specimens to taxonomists that specialize in the group of insects involved. We also screen the insect against the eggs of a number of closely related insects found in California to ensure that they have a sufficiently narrow host range; we do not want a new parasitoid to adversely affect our native fauna.

"Once these studies are complete, we apply to federal and state agencies for a permit to release. If this is obtained, the insect is taken out of quarantine and reared at one of the state's two mass-rearing facilities dedicated to control of GWSS. The insects are then released at strategic locations throughout the infested area."

The two mass-rearing facilities are Mount Rubidoux Field Station in Riverside County, headed by Morgan, and the Oswell Street Biological Control Facility in Kern County, headed by Dr. Greg Simmons, USDA-APHIS.

"The mass-rearing facilities' ultimate goal is to produce as many high quality natural enemies as possible," continues Morgan. "To do this, we capture adult GWSS from the field or rear them in cages and collect their eggs — just like collecting eggs in a hen house."

How do the production facilities operate? Describe the production facilities:

"In order to produce parasitoids we need to raise lots of plants for the insects

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to feed on and lay their eggs in. The eggs are then offered to the wasps that parasitize them. Less than two weeks later, the offspring emerge. These wasps are collected for release in GWSS-infested areas in Southern California.

"We also use the wasps and sharpshooters for research purposes, for instance, for testing newer and less aggressive insecticides, and in trying to develop more economical rearing techniques."

"In certain areas you cannot pursue aggressive chemical control," explains Morgan. "We release into organic, urban, and native areas where chemical control is limited and GWSS populations can be high. In this way, we hope to develop a viable control method for use in areas that may otherwise be considered as GWSS refuges."

What are the distribution plans for the wasps?

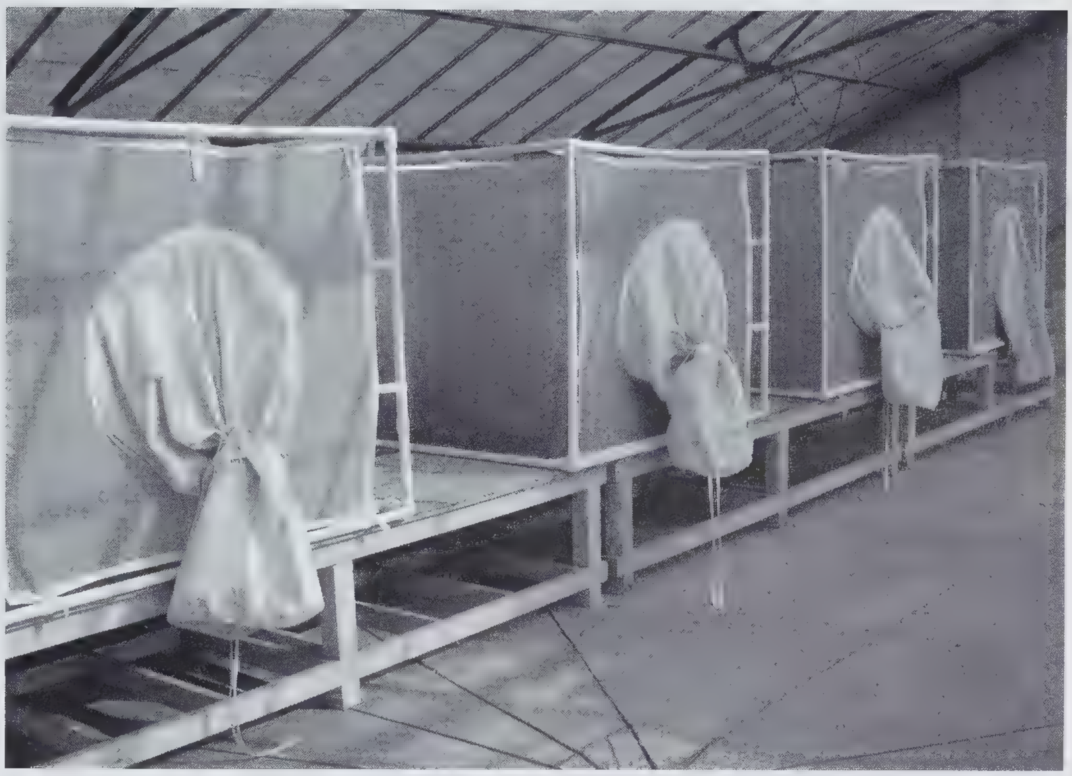
"We contact all sorts of people," explains Morgan. "Farmers, PCAs (Pest Control Advisors), and government representatives at the county and state levels who know about the area. We ask for advice about areas where we could release wasps where they are not going to be sprayed and killed immediately. Ultimately we end up targeting organic areas, public areas, and nature reserves. We try to locate close to threatened crops. Those are primarily nursery products or grapes. Most releases are made into citrus because this is the primary host plant of the pest year-round."

Is it a measure of success that populations be self-sustaining?

"We hope they would be," says Morgan. "It would be nice if it were from year to year, but at least for one year. Frequently, biological control producers augment populations that are already present. That is a very viable alternative. It's been done for over 50 years in California with great success. Basically they just add extra numbers at the beginning of the year, so the wasp has a head start on these pests."

Is there a goal in numbers? How many thousand *Gonatocerus* of a specific species are needed to manage the GWSS in Temecula?

"A lot of people like doing that," notes Morgan. "They like counting. That is not



Large greenhouse cages used for rearing glassy-winged sharpshooters.

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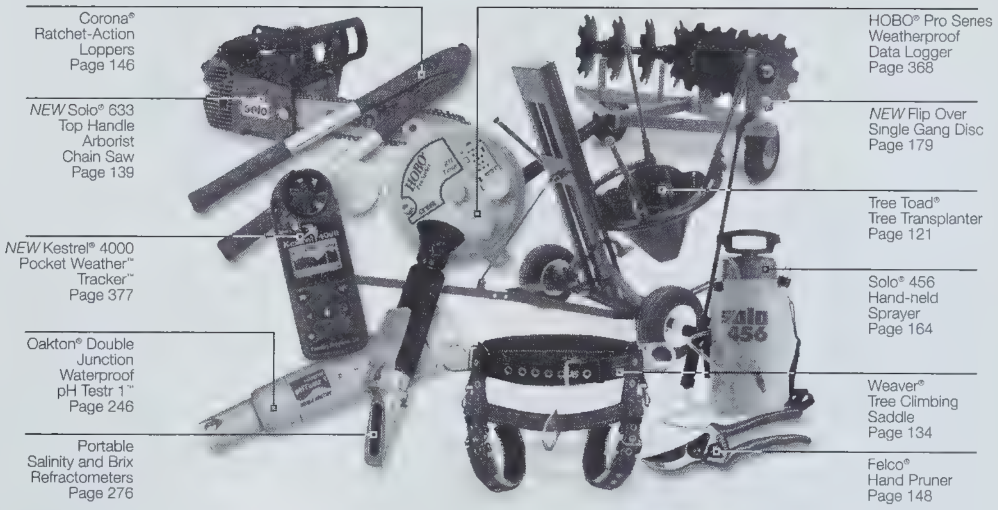
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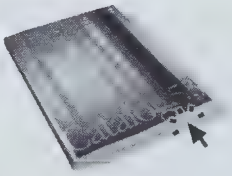

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the sole priority. Obviously the more the merrier, but there's also the aspect of quality, for instance how long the insect lives, how many eggs it lays, and how well it can find its host. Often by increasing production you can actually reduce the quality. We also aim to keep the quality up.

"It's basically a case of do you want 10 wasps that look for insects for one day or do you want one wasp that looks for insects for 10 days? By dealing with different temperatures and different parameters you may be able to alter the setup so that you get different qualities, as opposed to different numbers. That's one angle.

"The other angle is the right insect. It's not just numbers, it's the right insect. We could be producing billions of insects, but if they don't do what we're expecting them to do, then we might as well be producing none."

Is there a percentage in the spring generation you are hoping to achieve?

"No, we don't have a target," responds Morgan. "We are hoping to optimize, to get as many as possible. I haven't looked at data from 2002 yet. In the past, it started off at 15% to 20% parasitism at the beginning of the year. Then it builds up so that by mid-year, it's in excess of 90%. We are obviously hoping to increase that 15% to 20% upwards."

Are there other biological control options that have been considered for GWSS besides parasitoid wasps?

"There are other control methods that occur in the southeast U.S. that we've been unable to make use of," says Morgan. "We noticed bacterial and fungal pathogens, especially fungi. Now, those don't work very well in the desert. Those agents really get cooked with ultraviolet light, low humidity, and high temperatures. So we cannot use that methodology.

"Another method is using predators that feed directly on GWSS adults, nymphs, or eggs. There are some good predators in the southeast, but the trouble is they are not very specific. They eat a wide range of insect species. It's very difficult to do quality tests and proper screening and be assured that a particular predator is specific to the sharpshooter. On the whole, these predators aren't specific. They eat what comes their way.

"We cannot really introduce predators from another part of the world or another part of the country without potentially disrupting the ecology of California. However, we are looking into the predators that already exist in California."

How will success be measured?

Morgan differentiates between ultimate and short-term success criteria: "Success is ultimately measured as an area-wide reduction in GWSS populations, elucidated by intensive monitoring by the CDFA using yellow sticky traps. In the short-term, we measure success by recovering offspring of wasps originally released. This shows that our wasps have been able to successfully search for, parasitize, develop, and reproduce on GWSS in California. Every wasp of this sort that we capture not only represents one dead GWSS, but also reflects the many insects we do not capture that are continuing to control the pest."

What will be the role of biological control agents in areas where exclusion and eradication are the goals, such as the North Coast of California where GWSS has yet to establish?

"The first line of defense in a new area is eradication," responds Morgan. "In these areas, parasitoids have a limited role. Their importance lies in areas where widespread and stable GWSS populations already exist, where eradication is not feasible." ■

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FOCUS: PIERCE'S DISEASE

Turning the tide on glassy-winged-sharpshooter management in Temecula Valley

BY Raymond Hix, Nick Toscano, Rick Redak, and Matthew Blua
University of California, Riverside, CA

Temecula Valley was the first viticultural area in California to be seriously impacted by the glassy-winged sharpshooter (GWSS). The pest is responsible for the spread of a bacterium, *Xylella fastidiosa*, the causative agent for Pierce's disease (PD). Although PD problems were first identified in 1996, it took until 1999 for the wine industry to realize the severity of the situation.

In response to the crisis, an ongoing cooperative demonstration project was initiated in 2000 to examine the impact of area-wide management strategies on GWSS populations and PD incidences in Temecula Valley. The Temecula Advisory Committee consists of representatives from winegrape growers, citrus growers, University of California-Riverside, USDA, CDFA, and the Riverside County Agricultural Commissioner's office.

Based on grower surveys, there were approximately 2,030 acres of wine grapes in production in 2000 in the Temecula viticultural area, along with 1,600 acres of citrus. About 850 acres of grape vines were removed because of PD by May 2002.

Key strategies of the project are to reduce the GWSS population and remove sources of *Xylella fastidiosa*. This includes removal of abandoned citrus trees and vineyards in Temecula.

GWSS populations were monitored weekly in citrus and grapes from March 2000 to the present by trapping with yellow panel (about 500 traps), visual counts (adults, nymphs, egg masses), beat sampling, and sampling for GWSS with a hand-held vacuum device.

Although winegrapes are the most vulnerable crop in Temecula Valley to the diseases caused by *X. fastidiosa*, other crops were scrutinized for contributions to GWSS population growth. Citrus was the most prominent year-long reproductive host of GWSS in Temecula. GWSS seemed to concentrate in citrus over the winter months when grapes and most ornamental hosts were dormant.

Clear objectives

Objectives of the cooperative demonstration project are:

1. Determine impact of the 2000 area-wide management program on GWSS populations in citrus, grapes, and other plant hosts in the ecosystem for their applicability to the 2001, 2002, and 2003 seasons.
2. Determine impact of the area-wide program on GWSS adult oviposition and nymphal development.
3. Determine impact of the GWSS program on beneficial citrus insects, pest upsets, and GWSS parasitism.
4. Evaluate the biological and economic effectiveness of an area-wide insecticide program against GWSS.

In the 2000 season, most of the commercial citrus in the Temecula Valley viticultural area was treated in April and May in an effort to destroy a substantial portion of the GWSS population. The treatment of 1,300 acres of citrus in Temecula with the soil-applied insecticide Admire (imidacloprid) represented a pivotal shift toward area-wide management of GWSS.

Although effective in most cases, Admire was not 100% successful on citrus in 2000. Improper application of Admire or poor uptake by weak trees sometimes prevented it from reaching the foliage. Lorsban was used in 2000 in areas where Admire failed to provide adequate control of GWSS in citrus.

GWSS populations tended to be clumped, with high numbers often found on weak trees. Results from the 2000 project indicated that every tree or acre does not need to be treated. GWSS numbers remained low in citrus treated with Admire during 2001.

Troublesome areas or "hot spots" were identified from the 2000 project, and by early monitoring from January to April 2001. This led to the treatment of 269 acres of citrus with Admire in March and April 2001. An additional 319 acres of citrus were treated "as needed" with foliar applications of Baythroid between May 21 and August 15. A helicopter applied Baythroid to all but 45 of those acres, with the remainder done by an airblast sprayer.

An additional 106 acres of organic lemons received treatments of horticultural oil Gavacide C (certain horticultural oils such as Gavacide C are allowed by California Certified Organic Farmers and OMRI). Two small abandoned vineyards with absentee owners and high incidences of PD and GWSS were treated with Danitol by helicopter.

Organic citrus groves were problematic areas. GWSS populations remained high in these groves until August 2001 treatments of a 440 oil by airblast sprayer. In April 2001, Surround (kaolin clay), 1.2% Gavacide C (a 440 oil) and 1.4% Gavacide C were applied to certified organic lemons (four replicates of three acres each).

Results from Gavacide C were promising, and two more organic lemon groves (30 and 52 acres) were treated with 1.25% Gavacide C on August 4, 2001 (750 gallons per acre).

Follow-up oil treatments were applied to organic lemons and to 24 acres of organic grapefruit in August 2002. This was the first time that GWSS populations were impacted in organic situations.

The oil resulted in 62% and 71% reductions in adult GWSS populations in these groves. About 50% of the egg masses contacted by the oil were killed, and subsequent oviposition was reduced. About 99% of parasitic wasps from oil-treated parasitized egg masses emerged, compared to only 2% for Baythroid-treated egg masses.

In April 2002, 140 acres of citrus were treated with Admire. An additional 89 acres were treated with foliar applications of Assail (acetamiprid, another nicitinoid recently registered in California) for citrus on an "as needed" basis in July 2002. Many grape growers treated grapevines with Admire or made foliar applications of Provado (imidacloprid), or Danitol (another pyrethroid). Recommendations were made to destroy infected vines in order to remove bacterial reservoirs.

The current situation in Temecula is serious, but cautious optimism prevails. First, GWSS populations in Temecula citrus groves are currently lower than on any other citrus in the Riverside area. For example, a conventional citrus grove in Redlands had weekly peak catches of 66.0 adult GWSS per trap, and an organic lemon grove in Temecula had 26.4 GWSS per trap in July 2001.

In 2002, the July peak for all non-organic Temecula citrus was 0.25 GWSS per trap, while the peaks for the grove in Redlands and organic Temecula grove were 217 and 4.6 GWSS per trap respectively. The Temecula organic lemon grove was treated with Gavacide C August 6 to 9 in 2002.

Second, there was some replanting in 2002 (2% or less), especially in high visibility areas, for both aesthetic reasons and to explore the feasibility of reestablishing lost vineyards. Based on a survey of five Temecula wineries, 2001 wine grape production ranged from 47% to 77% of the 1995 harvest with production ranging from 3.7 to 7.8 tons per acre in 1995 to 4.3 to 6.0 tons per acre in 2001.

However, Temecula is providing few wine grapes to other areas due to economic forces. As a result, the 2000 and 2001 harvests were more than adequate to sustain Temecula wineries with substantial surplus. In the future, Temecula will likely concentrate on producing quality wine grapes for Temecula's wineries. ■

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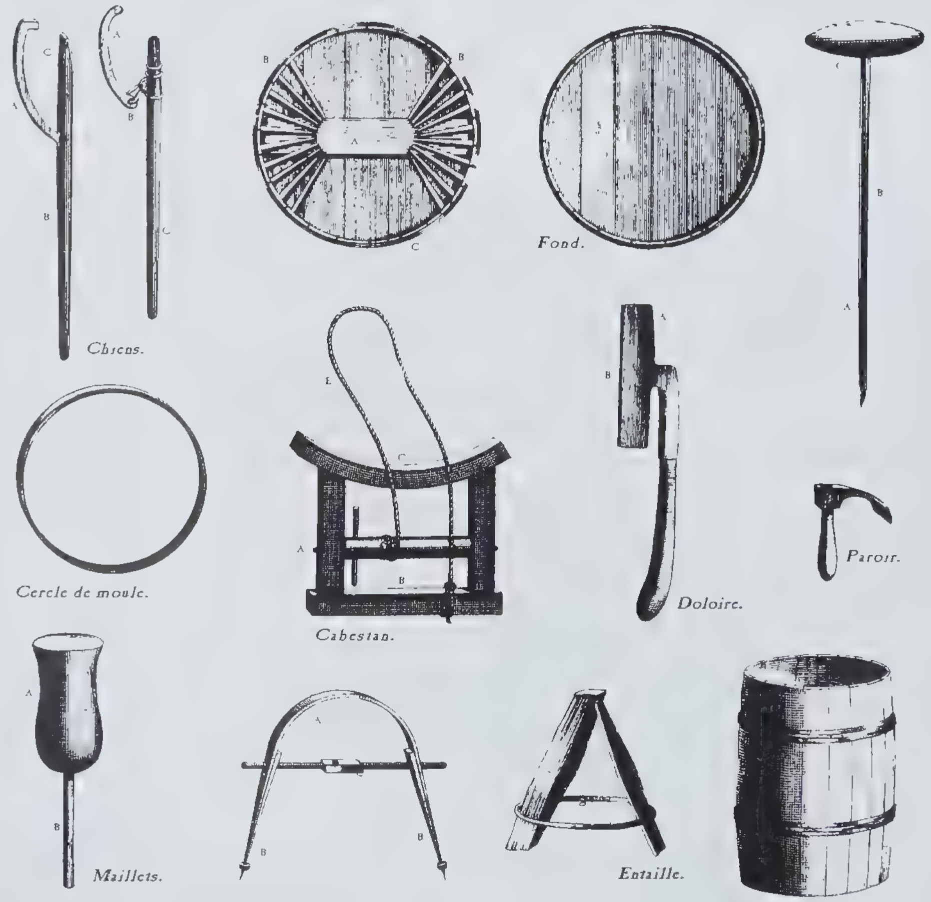

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Ecological viticulture

Promise of agroecology

BY Dr. Andrew Lorand

Growing fine grapes for world-class wines goes beyond having the "right" rootstock or the right trellis system. Increasingly, winegrowers want to bring the soil to expression, attend to the environment, and care for our communities. As a result, viticulture and enology have become more than just agricultural and food sciences. In recent years, they have been cross-fertilized by the ecological and social sciences as well as by traditional and alternative farming systems.

A new, comprehensive approach is emerging, which we can call "ecological viticulture." Ecological viticulture, generally defined, is the attempt to maximally harmonize vineyard management with Mother Nature so as to a) restore ecological health, b) produce the highest quality grapes that are as expressive of unique sites as possible, and c) create the most positive impact economically, environmentally, and socially.

Agroecology is one of several subsystems of environmentally effective and socially conscious farming systems being tested and adapted into ecological viticulture. Others include organic farming, permaculture, and biodynamics. The term "ecological viticulture" is an umbrella term for all of these alternative farming systems applied to grapegrowing.

Exploring inovation

As a combination of agriculture and ecology, agroecology has developed key innovations over the last several decades, forming them into the science of sustainable farming systems. It is already revolutionizing the way scientists and farmers think about agriculture.

The centerpiece of agroecology is the understanding of a farm or even simply a crop field as an ecological system. Thus, key ecological phenomena, such as soil fertility (including nutrient and water availability, humification, mineralization, etc.), biodiversity (species diversification, competition, succession), and disease/pest/weed management (predator/pest interactions, immunity, resistance) are studied carefully *and* in relationship to one another in order to analyze their interactions.

As in any living system, the elements and principles that make up the ecological system in our vineyards are complex, integrated, and often subtle. All of them affect one another throughout the season.

The comparative advantage to this ecological whole-systems approach (versus seeing vineyard components as separate and not necessarily connected) is that one gets a much truer picture of what a crop actually faces in the course of its life. Additionally, one is less likely to miss subtle or long-term ecological problems or unintended consequences.

Perhaps most important, one gets the benefit of planning, managing, and reviewing with multiple, coordinated perspectives. Farming without the advantage of agroecological principles and practices is a bit like driving without any side or rear-view mirrors. It can be done, but we are more limited than we need be.

Is it practical?

A key to understanding agroecology is in appreciating its attempt to restore and enhance the natural "dynamic equilibrium" of a vineyard. Dynamic equilibrium is a term used to describe the ability of a given piece of land or a bioregion (or a plant or an animal) to restore itself to health in the face of ever-present challenges (including those brought on by production pressures). In other words, it wants to restore the natural health of the land (natural resistance, immunity, restorative capacity) as much as possible using ecological methods.

Learning to understand dynamic equilibrium means learning about the agro-ecosystem's health components. These are part of the overall production equation that includes *terroir*, climate, management, etc. Understanding and tracking these components helps us answer the all-important production question: What impact will any given act or omission have on the health (dynamic equilibrium), productivity, and quality of a vineyard?

Agroecology supports vineyard health, productivity, and quality using several key principles which promote:

a. **Soil fertility** (such as increasing stable humus, protecting against erosion, recycling/reusing biomass, optimizing nutrient and moisture availability, protecting indigenous micro and macro fauna and flora).

b. **Biodiversity** (such as enhancing diverse biotic activity in the soil, increasing diversity of beneficial plant and animal life, enhancing biological interactions between beneficial insects, plants, and animals).

c. **Pest prevention** (such as strengthening a vineyard through choosing healthy plants to begin with, enhancing natural immunity and resistance of vines to diseases and pests, avoiding known pest hosts, increasing levels of natural predators of pests, using natural pesticides).

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d. **Appropriate production** (such as planting well-adapted species, rootstocks and varietals, adopting a production system best suited for the site's ecology, adjusting expectations to the vineyard's long-term ecological capacity).

Practically speaking, these principles lead to such practices as composting, cover cropping, crop rotation, mulching, the use of biological foliar sprays (such as compost teas), poly-cultures, insectaries, and non-invasive domestic and wild animal integration.

The menu for the practitioner includes long-term investments and programs because ecological health is a long-range goal. Many growers are already using one or more of these agroecological practices, yet without a comprehensive, systematic approach, they are depriving themselves of the full benefits of the whole system.

Research-based and effective

Currently agroecological research is being carried out in viticultural regions around the world. One of the forums for such work is IFOAM (The International Federation of Organic Agricultural Movements), which holds a bi-annual International Congress on Organic Viticulture. I attended the 2000 congress in Basel, Switzerland, and found it helpful. The most recent one was in August 2002 in Victoria, B.C. (see www.cog.ca/ifoam2002).

In Basel, several presentations examined aspects of agroecology and viticulture. An example: "Plant Biodiversity and Biological Control of Insect Pests in a Northern California Organic Vineyard" by Nicholls and Miguel Altieri. Altieri is a professor at UC Berkeley and one of the better-known representatives of modern agroecology. He has written a book and several significant papers on the subject. See: http://www.cnr.berkeley.edu/~agroeco3.

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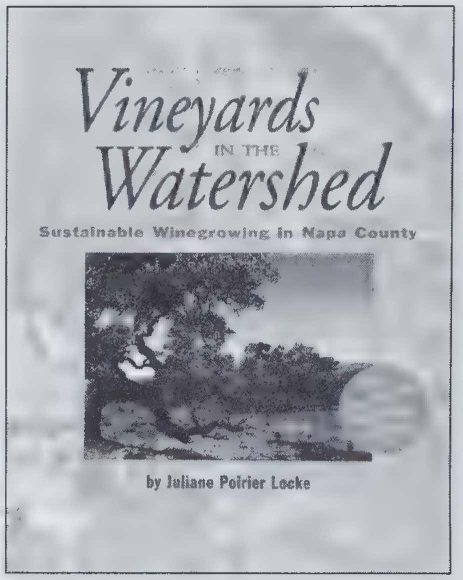
Agroecological research is also being carried out on a variety of crops and cropping systems at various universities around the U.S. and the world. Such topics as compost teas, beneficial insects, and soil fertility programs are often at the top of their research agendas. In many, if not most cases, strong benefits of agroecological practices are being demonstrated. See: www.umass.edu/umext/programs/agro/, www.aces.uiuc.edu/~asap, www.gwdg.de/-~uaoe/, www.wirs.aber.ac.uk/-research/ organic.shtml as examples.

Agroecology is a serious framework for innovation in viticulture. In the end, creative innovation carries the day. Naturally, the proof is all in the pudding — or in the field and in the bottle in the case of grapegrowing.

In upcoming articles, I will explore in depth various key agroecological sub-topics, and I will also reference specific research projects and papers. I will also describe various how-to's of agroecology's specific practices, and explain what I can about their effectiveness, costs, and applicability. ■

Andrew Lorand is a consultant for ecological and biodynamic farming systems. He grew up in the midwest and was trained in Switzerland, where he studied both viticulture and milk production and processing. He holds a Ph.D. in agricultural education from Penn State University's College of Agricultural Sciences, and Swiss federal certification as a farm manager. He farmed for 10 years before starting his academic work and is currently a full-time consultant. His website is www.andrewlorand.com — his email: info@andrewlorand.com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Flavor & Zinfandel

Noted chef and Zin producer addresses Zinposium 2002

BY Michael Chiarello

Michael Chiarello, the founding chef of Tra Vigne in St. Helena, CA, frequently stands on a soapbox to support his favorite food wine — Zinfandel — and the unique character of the grape and its band of idiosyncratic producers.

Chiarello is a big believer in telling the stories behind great food and its ingredients, marvelous wine and its producers. Zinfandel's colorful history is a perfect backdrop for his inspirational message: Know the stories of the foods and wines you love, surround yourself with people you care for, and you'll create a lifetime of lasting memories around your table. These remarks are edited from his address to the Zinposium 2002 Conference on American Zinfandel held in June 2002 in Rohnert Park, CA.

I'm in the flavor business. Over 20 years in a professional kitchen, I enjoyed the challenge of having 20 minutes to find the freshest ingredients and prepare a great meal — 400 times each night. In my restaurants, I'd try to condense flavors into two courses, where other chefs might try and draw them out over three or four.

The versatility, depth, and layers in Zinfandel work perfectly for me. While Cabernet and Chardonnay are "course" wines, Zinfandel is a wine I don't have to worry about, I don't have to restrict my cooking for. As a chef, I get along great with Zinfandel! When I create food experiences, I want people to experience flavor intensely and quickly, and let their palates get "full" with less food so they're not regretful the next day. Zinfandel is the wine that is there to "have a party."

CHIARELLO ON TASTE

We taste in our mouth, yes, but we also taste intellectually and emotionally. I taste the relationship between my mother and me when I cook a dish she taught me, adding to the tasting experience that wonderful emotion of having someone love you unconditionally. I like to expose people to this way of thinking, in particular when enjoying wine.

Think about the layers of flavor and the ways to taste wine. If we understand wine intellectually, that understanding is limited. But if we understand a wine emotionally, or if we have a relationship with the wine because we know its story, we begin to enjoy that wine on a different level.

When we know the story of Larry Turley, (Turley Wine Cellars, Templeton, CA), an ex-emergency room doctor who turned his attention to tending old vines back to life, and we know his larger-than-life personality and perseverence in creating big, bold, old vine Zinfandel, our enjoyment of his wines shifts. Tasting should be done with our mouths, our minds, and our hearts, and Zinfandel producers have heart. As a chef, I concentrate on the mouth, and within two courses, the mouth should be full of flavor. Zinfandel is there with me along the way.

ON "FULL"

"Full" is a subjective word. Your stomach can be full after eating two dozen rice cakes and drinking water. Another way to get full is for your palate to be full, for your mouth to feel "full." When your mouth gets full, it tells your mind "I've had enough," and that's where Zinfandel comes in. Zinfandel is very easy this way; you want to roast a lamb and sit outside on a beautiful day. Zinfandel is your "buddy."

The layers in Zinfandel allow your palate to get full. You can go from the lamb to chicken to sausage, and Zinfandel will chase right with you. Zinfandel is a golden retriever who will sit by your side no matter what is going on, and have a great time. Zinfandel has always been a huge part of how I create flavor, and what I create to fill the palate.

ON BUILDING FLAVOR

Flavor starts with a foundation, and layers are added with experience. The depth and size of your foundation is in direct proportion to the layers of flavor you're able to build. Building these layers of flavor is what Zinfandel producers do; so when I taste someone's wine, I am looking to see that these layers are in the right order.

I then want to further the experience by hearing the story behind the wine, hitting on either the intellectual side or the emotional side of tasting. I want to taste the story in the glass each time I drink it. Zinfandel producers have stories, and consumers need to know those stories.

I believe, since I saw it in my restaurants time and time again, that if we can

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allow consumers to taste the story in a glass of wine, the wine will taste twice as good to them. Their enjoyment will grow exponentially. Yet the wine will not have changed at all. The stories of Zinfandel producers, big flavors, passion, and the golden retriever qualities are what I look for in a great wine.

ON WINEMAKER MOTIVATION

We all know the joke about the wine business: you work a 16-hour day, come home at night, empty your pockets, and you know the money will be gone in the morning. It's a tough business, and for many, it's not a profitable business. But we don't do this for financial reasons; we do it to tell our stories through our wines.

I most appreciate Zinfandel producers for taking a stance and not following the lemming mentality of producing the same straight-up wines as everyone else. And most of all, for telling a story of their own through their unique wines, wines with real character and soul.

Zinfandel is my passion. I took most of the property around our house in St. Helena for some old vine and young vine Zinfandel, and have had fun building some flavors into Chiarello Family Vineyards, which just began to sell in 2001. Each of my wines is named after one of my daughters, reflecting three very different characters in each of them. The wines tell a personal story. Americans need tradition, stories, flavor in their lives, and Zinfandel producers provide it with aplomb.

ON FOOD PAIRING

What doesn't Zinfandel go with? We talk about specific produce a lot: artichokes, asparagus, these kinds of things. But I always cook with what's in abundance, what's in season, then find a bridge from that to the wines with my flavors. So I'd roast an artichoke, add some carmelization, drizzle a balsamic reduction sauce, and vintners would come in and say "You can't serve that with my wine." But it's artichoke season, so what do you want me to serve?

I think if you carmelize things it creates a bridge between something that's typically not great with Zinfandel, so don't be afraid to build bridges like this to your wines. And eating with your hands always helps, too. ■

Michael Chiarello is the owner of Chiarello Family Vineyards (www.chiarello vineyards.com) and creator of NapaStyle line of specialty products (www.napa style.com). He is a five-time author, including the new Michael Chiarello's Casual Cooking *and* The Tra Vigne Cookbook. *He hosts a weekly public television series,* Michael Chiarello's Napa, *which airs nationally on public television, and is a monthly contributor to CBS's* The Early Show.

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Birth of a micro-winery

BY Susan Ryan, ozborndooli Architecture, Santa Rosa, CA

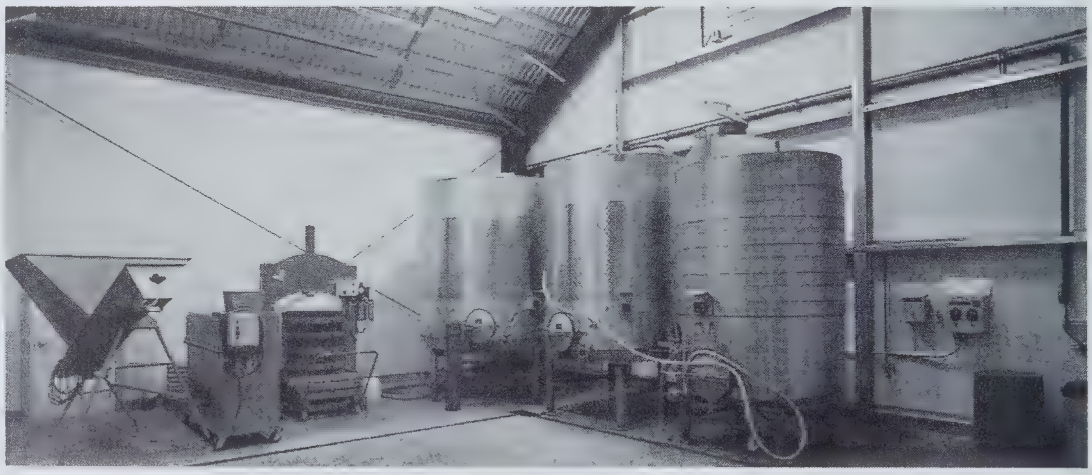
In recent years, wineries have been popping up in Northern California as quickly as mushrooms after a winter rain. Lately we have been witnessing the resurgence of "Mom and Pop" operations, better known now as "micro-wineries." These small-scale wineries produce 2,000 to 5,000 cases annually and are currently enjoying a great deal of success. Several basic questions must be addressed in design of a micro-winery. Among them are: Where to crush? Where to ferment? Where to age wine?

Answers to these questions help shape micro-winery design, which can range from simple and functional to elaborate and grand. One example of the former is the Paloma Winery on Spring Mountain, St. Helena, CA. Jim and Barbara Richards of Paloma Winery got into winemaking largely by ignorance. They were looking for a place to retire when a friend showed them property on Spring Mountain overlooking Napa Valley. They loved it.

There had been a vineyard on the property in the late 1800s, and they were intrigued. A vineyard struck them as a good investment opportunity, so they took classes, got advice from neighbors, and jumped into winemaking with both feet. The friend who showed them the property grew Merlot grapes, and he suggested they give Merlot a try. After they planted their first vines, winemaking friends expressed concern that Merlot grapes might not do very well on their mountain (2,040 to 2,240-foot elevation) terrace. Disconcerted but resolute, Jim and Barbara ultimately proved them wrong. In 1985, two-thirds of their 15-acre vineyard was planted with mostly Merlot grapes, along with some Cabernet Sauvignon to use as a blend. They planted the rest of the vineyard in 1988, adding a small amount of Syrah.

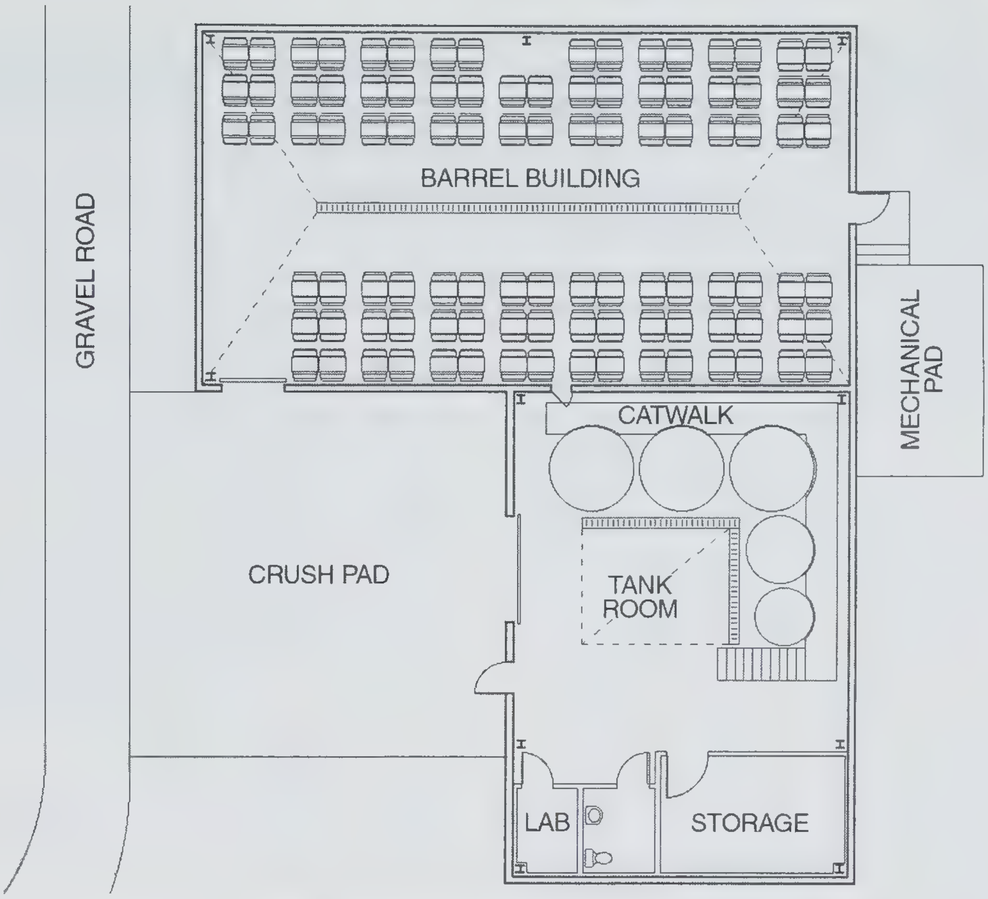
After selling grapes in the early years, the Richards made their first wine, a Merlot, in 1994 and released it in 1996 to much success. The Syrah they grew for themselves and their neighbors, making the wine in their basement. The wine turned out so well that their winemaker, Bob Foley, suggested they sell it. They now make around 125 cases per year, selling all they make. Until the 2000 harvest, the Merlot wine was produced at another winery. With the desire to estate bottle their wine, Jim and Barbara contacted ZFA Structural Engineers (Santa Rosa, CA) about building a winery. Dennis Fagent, a principal at ZFA, introduced them to ozborndooli Architecture in February 2000. They met with Dick Osborn and asked him to design a winery for the 2000 harvest.

Barbara and Jim are very hands-on in their winemaking. Barbara supervises the vineyard and Jim runs the crush. They wanted a winery facility that could produce 2,000 cases annually and could be operated by one person. They had sited the winery on a part of their property that had been originally graded for their home, but had been abandoned for another site further up hill. In designing the winery, Osborn had to consider the needs of a red wine facility: barrel storage, tanks, crush pad, and circulation patterns. A two-room, L-shaped, 3,600 square foot building with a 30 x 40 square foot cement pad outside was the result.



After the schematic design of a winery is complete, typically ozborndooli Architecture would begin to shepherd the project through the permit process. Jim Richards chose to handle the permits himself. Richards is reluctant to say much about Napa County's permit process, except that it would save a lot of time and money to get a good land use attorney at the start of the permit process.

A metal building shell was chosen due to its ease of construction and low cost. Soule Building Systems fabricated the building shell based on specifications from ozborndooli and ZFA. Originally, Osborn proposed a board and batten exterior so the winery would appear similar to other buildings on the property. The wood was to be attached with sheet metal screws to the exterior insulated metal panel. The panel was to have a thicker gauge aluminum face on the exterior in order to secure the wood veneer.



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Because of budget considerations, contractor Jim Crawford suggested changing the exterior finish to Texcoat, resulting in considerable cost savings. The Texcoat finish was sprayed onto the metal panels in place leaving a texture of stucco. Wall panels were supplied by the metal building contractor. They are fabricated with prefinished sheet aluminum faces with a foam core (R-30 insulation value).

The foundation was a poured concrete slab over sand and gravel. A waterproof membrane was placed between the slab and the gravel to provide a moisture barrier. ZFA coordinated the design criteria for the metal building and the foundation and anchorage to the metal building. An eight-inch-high concrete curb was poured around the perimeter of the building to keep forklift blades from damaging the metal wall panels.

The floor slopes 1/8 inch per foot to a precast trench drain that has a stainless steel basket. On the crush pad, there are two drains in the center of the pad with the concrete sloped to the drains. In the tank room, the trench drain is located directly under the tank doors so that when the tanks are cleaned the residue can go right down the drain.

The barrel storage room's pre-cast trench drain has a heavy-duty grate that can withstand the weight of a forklift. All drains in the winery are connected to pipes that lead to a process wastewater septic tank. There are two septic tanks, one for process waste and one for domestic waste.

In the winter, when the crush pad is not being used, the drains are plugged so that rainwater can be diverted to a covered, gravel-filled pit at the edge of the vineyard. Rainwater is absorbed by the vineyard. This is done to keep excess water out of the septic tank.

Jim Richards wanted to stack the wine barrels no higher than three barrels, and he wanted the flexibility of racks. So Osborn put the plate height (the lowest point in the ceiling) in the barrel room at 11 feet to allow for the height of the barrels on racks (nine feet), along with room for a forklift to hoist barrels off the stack. The exposed structural components were galvanized, so they wouldn't rust.

The ceiling is a prefinished metal panel with four-inch rigid board insulation over the prefinished panels, giving it an R-value of 30. The roof is a standing seam metal with a "Zactique" finish. The pewter color finish is durable, fire-resistant, and attractive. The mechanical pad is a concrete slab behind the tank room. There is an exhaust fan for night cooling and CO_2 exhaust. For humidity control in the barrel room, the slab is watered down on an as-needed basis. Water on the property is too hard to use in a humidifier.

Harvest at Paloma Winery

During the first crush in the new winery, Jim rolled the equipment out

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onto the crush pad from the tank room. Hand-picked grapes were dropped into buckets and emptied into two bins pulled by the crawler tractor from the vineyard for delivery to the crush pad.

At the crush pad, a forklift moved bins onto a portable scale for weighing. Most bins weigh about 900 pounds. After the weight was recorded, the bin was taken to the hopper by the forklift to begin crushing. Each bin of grapes was tilted above the hopper, and grapes were raked out in small portions. The hopper fed the grapes into an auger, which fed the grapes to a destemmer. Stems came out one side of the machine, and the must coming out of the bottom was pumped into a stainless steel tank or half-ton picking bins for fermentation. A hydraulic basket press was chosen because it was less expensive, easy to clean, and presses gently. One Zinfandel vine is left from the original 1800s vineyard, and Barbara always throws a cluster of grapes from the old vine into the first press of Merlot for good luck.

The fermentation strategy is to try to keep the must cool and allow a cold soak for 24 hours before inoculation with Lalvin EC1118 yeast. The must is encouraged to warm up during fermentation, but not over 90ºF.

Fermentation progresses over a period of seven to 10 days, and pressing occurs at dryness. Free run and press wine are combined and allowed to settle in a tank for three to five days, then racked off gross lees to barrels.

There are three Santa Rosa Stainless Steel tanks in the tank room (1,500 gallons, 2,000 gallons, and 3,000 gallons) with space for two more. These tanks are jacketed and temperature-controlled. Glycol is pumped through the jacket to cool each tank during fermentation. During the 2000 harvest, Jim climbed a ladder to bring the hose up to the top of the tanks as he pumped juice into them. A catwalk was completed for the 2001 harvest. Usually the Paloma Vineyard yields about three to four tons of grapes per acre, producing a total of 45 to 60 tons annually. In 2000, phylloxera reduced the yield to 25 tons. Barbara has interplanted new vines between the diseased vines, which brought their yield up in 2001. When the harvest is small, as in 2000, fermentation is done in bins instead of tanks and the cap is punched down three times daily until dryness.

Barreling and Bottling

When the wine is ready, it is put into barrels for 18 months. The barrels are a mix of used and new. The Richards' don't like a strong oak flavor. When the wine is ready to be bottled, a mobile bottling line is brought in.

At the end of harvest, all of the equipment (forklift, hopper, auger, destemmer, press, bins, scale) is rolled back into the tank room for storage until the next crush.

There is plenty of room for a forklift to maneuver within the building. The doors were made high enough (12 feet in the fermentation room and 10 feet in the barrel room) so that during inclement weather, Jim is able to move the equipment inside and continue with harvest.

Conclusion

When designing a winery of any size or scale, you need to consider aesthetics, economics, and durability. The needs and desires of the owner and winemaker must be balanced and size, circulation, power requirements, water supply, drainage, finishes, temperature and moisture control, and materials considered. When all of these components are properly considered and arranged, then you have a well-functioning winery and a happy client.

For the Richards, this meant versatile spaces and a simple, efficient design with inexpensive but durable materials. This very basic winery has worked well for the Richards. The proof is in the bottle. ■

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CENTRAL SAN JOAQUIN VALLEY

When diffuse sunlight works best

A study of sunlight exposure and temperature effects on berry growth and composition of Cabernet Sauvignon and Grenache

BY Juliet Bergqvist[1], Nick Dokoozlian[2]* and Nona Ebisuda[3]

Synopsis:

This study examined effects of sunlight exposure on berry growth and composition of two red wine grape cultivars grown in the central San Joaquin Valley of California (Region V). Cabernet Sauvignon and Grenache grapes were grown in a range of sunlight exposures (mid-day photosynthetically active radiation (PAR)10 μmol m^{-2} sec^{-1} [shaded] to greater than 600 μmol m^{-2} sec^{-1} [fully exposed]) from berry set to harvest.

Both cultivars were planted in east-west oriented rows, and experimental clusters were evenly distributed between the north (afternoon shaded) and south (afternoon exposed) sides of the canopy. Fruit response to sunlight varied based on cluster location within the canopy, and these results were at least partially due to measured differences in berry temperature.

At the same sunlight exposure level or PAR, mid-day berry temperature was generally 3° to 4°C higher for clusters on the canopy's south side compared to clusters on the north side. Soluble solids initially increased with greater sunlight exposure, then declined when mid-day PAR exceeded 31 to 50 and 51 to 100 μmol m^{-2} sec^{-1}, respectively, for clusters on the north and south sides of the canopy.

Titratable acidity generally declined as sunlight exposure increased, with Cabernet Sauvignon clusters on the canopy's north side maintaining greater acidity at the same exposure level than clusters on the south side.

Juice pH declined as exposure increased on the canopy's north side, while sunlight had little effect on juice pH for clusters on the south side.

Anthocyanins increased linearly as sunlight exposure on the canopy's north side increased, but declined when mid-day cluster exposure on the south side exceeded 100 μmol m^{-2} sec^{-1}. (Total phenolics generally followed a similar pattern.)

Results suggest that the effects of light on fruit composition are heavily dependent upon the extent to which berry temperature is elevated as a result of increased sunlight exposure. Prolonged exposure of clusters to direct sunlight should be avoided for maximum berry color in the central San Joaquin Valley and other warm regions.

Sunlight's influence on grape berry development and composition has been well documented over the past few decades. Previous studies have found that sunlight-exposed grapes generally have greater total soluble solids, anthocyanins, and phenolics, and lower titratable acidity, malate, juice pH, and berry weight compared to nonexposed or canopy-shaded fruits.[3,4,6,7,8,11,15,17,20]

These studies concluded that increased fruit exposure to sunlight generally improved both grape and wine composition. This research has had a profound effect on winegrape trellising and canopy management practices throughout the world.[19]

Despite this progress, the optimum range or amount of cluster sunlight exposure remains unclear. Much of the previous research compared either fully exposed or canopy-shaded clusters[3,4] or the effects of canopy manipulations, which dramatically altered fruit zone light environment on fruit composition.[17,20]

Few studies have compared the relative composition of grapes exposed to the wide range of sunlight typically encountered in commercial vineyards. Previous research indicated that sunlight exposure of individual clusters on the same vine may vary dramatically, based on cluster location within the canopy.[5]

As few clusters within the fruit zone are exposed to full sunlight, or grown in complete canopy shade, the relative effects of a wide range of sunlight exposures on fruit composition should be examined.

Berry temperature in the vineyard is largely regulated by the flux density of absorbed radiation and convective heat loss, and has been shown to increase linearly with incident radiation.[21] W.M. Kliewer and L.A. Lider reported that the temperature of sunlight-exposed Thompson Seedless berries was 3° to 8°C higher compared to berries in the canopy shade.[11]

While increased sunlight exposure of clusters is generally believed to improve fruit composition,[19] the concomitant increase in berry temperature may be detrimental — especially in a warm growing region such as the San Joaquin Valley (Region V) in California.

In studies using the fruit of potted vines grown under controlled condi-

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Acknowledgment: The authors are indebted to the American Vineyard Foundation, Oakville, CA, for supporting this study and other associated research on wine grape canopy management in California.

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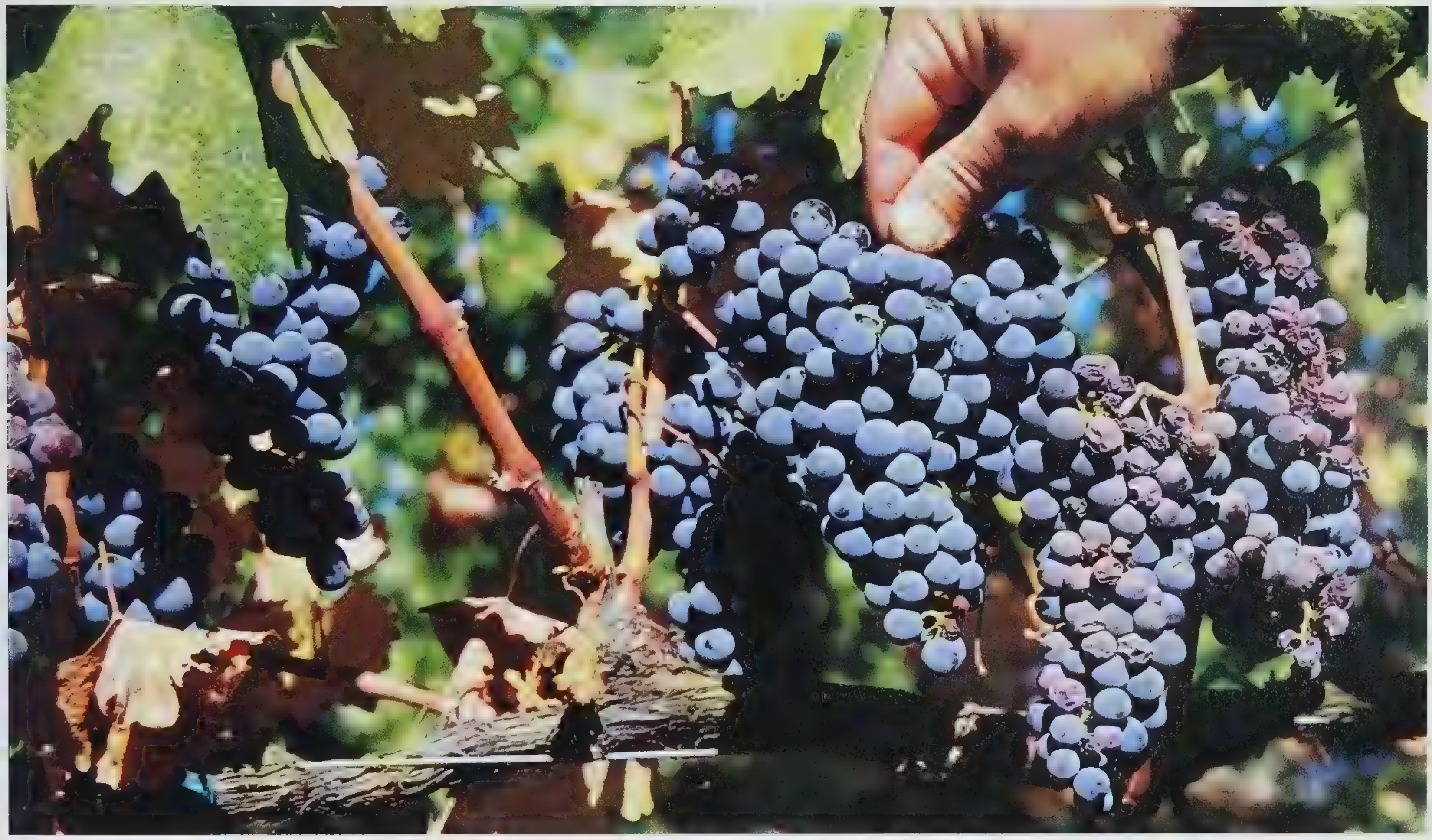

Cabernet Sauvignon cluster on right was grown on the exterior of a vertically shoot-positioned trellis system and exhibits characteristic symptoms of excessive sunlight exposure and elevated berry temperatures. Overall color development is poor, with many pink, desiccated berries. Cluster on left matured in the canopy interior, one or two leaf layers beneath the canopy surface. Photo taken in Oakville, CA, near harvest 2000.

tions, where sunlight exposure did not significantly increase berry temperature, high light intensities (greater than 25% ambient sunlight) resulted in maximum skin anthocyanin accumulation.[8,10,12] In contrast, the increased temperature of sunlight-exposed grapes in a vineyard may lead to reduced berry color, particularly in warm regions.[22]

The objective of this study was to determine optimum sunlight exposure for two red winegrape cultivars, Cabernet Sauvignon and Grenache, grown in the central San Joaquin Valley of California (Region V).[22]

MATERIALS AND METHODS

Plant materials and vineyard site

The trial was conducted at the University of California Kearney Agricultural Center, approximately 50 km southeast of Fresno, CA. Eight-year-old, own-rooted Cabernet Sauvignon (UC clone #8) and Grenache (UC clone #1A) grapevines, grown in nearby rows in the same vineyard block, were used.

Vines were planted in east-west oriented rows, spaced 2.4 m (between vines) x 3.7 m (between vine rows), bilateral cordon-trained and spur-pruned, and trellised to a two-wire vertical system. At completion of the previous growing season, the mean weight of one-year-old prunings averaged 5.8 and 4.2 kg per vine, respectively, for Cabernet Sauvignon and Grenache.

Treatments and experimental design

Experimental treatments were established one and two weeks after fruit set for Cabernet Sauvignon and Grenache, respectively. Fruit set was defined as the stage of berry development immediately following shatter (average berry diameter approximately 3 mm), corresponding to Stage 29 of the modified Eichhorn and Lorenz system.[2]

Eight clusters per vine (one cluster per shoot) were selected based on uniformity of shoot growth and cluster development. Clusters were divided into two groups of four, located on either the east or west cordon of the vine.

Four sunlight exposure categories were assigned to the clusters:

1) full exposure, generally exposed to sunlight throughout the day;
2) moderate-to-high exposure, exposed clusters had one to two-leaf layers of shade;
3) moderate-to-low exposure, two- to three-leaf layers shaded clusters;
4) shaded, clusters were located deep inside the canopy, with four or more leaf layers.

Selected leaf removal and trimming or tying of shoots adjacent to clusters was performed as necessary to establish desired exposure levels. Experimental clusters were evenly distributed between north and south sides of the canopy, and positioned to hang freely and parallel to the trellis post.

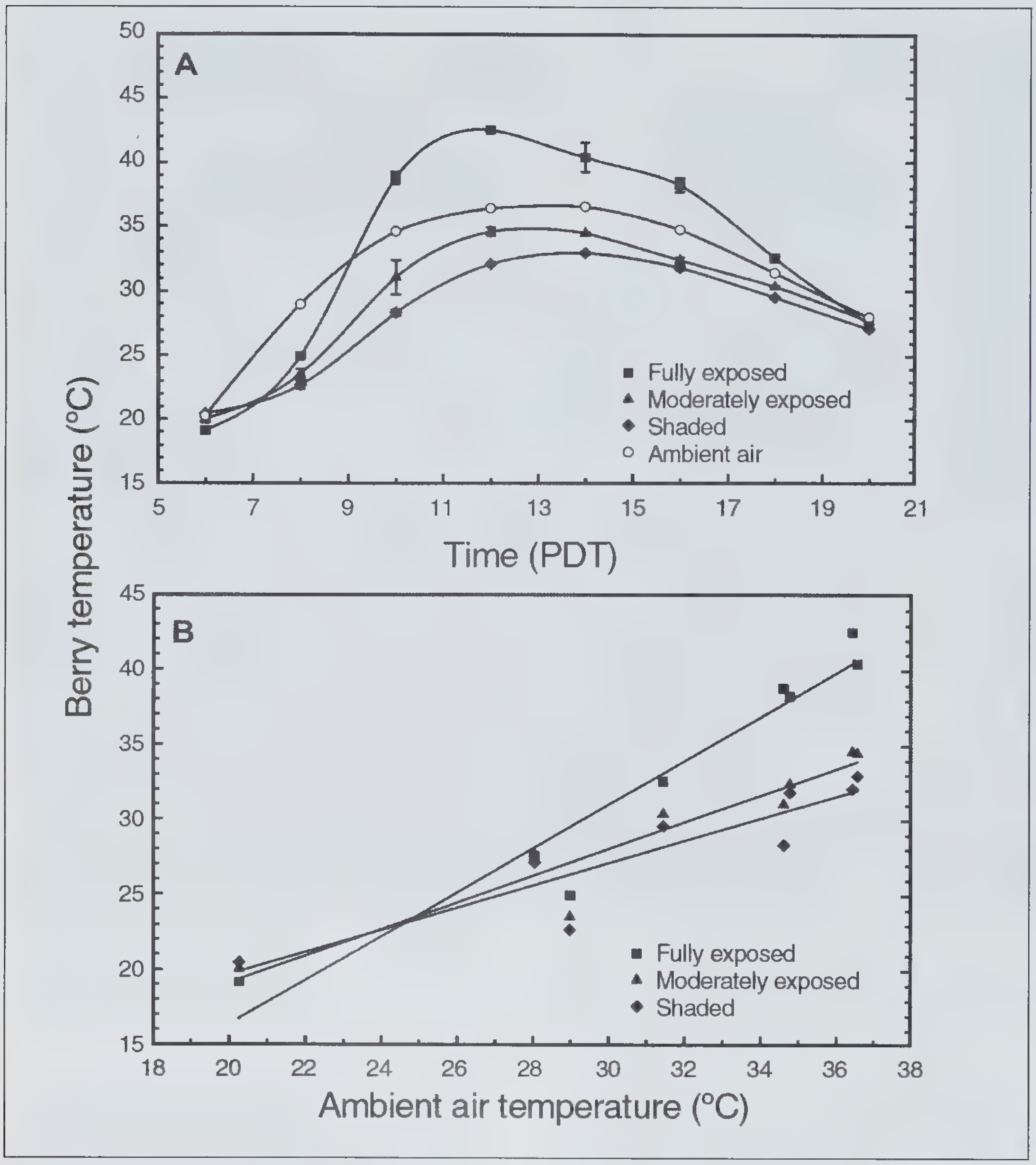

Figure I (A) Diurnal variation in the daytime ambient air and berry temperature of fully exposed, moderately exposed, and shaded Cabernet Sauvignon grape clusters approximately two weeks prior to harvest. Each data point represents the mean of three single-berry measurements per cluster. Vertical bars represent the standard mean error (+/–). **(B)** Relationship between ambient air temperature and berry temperature of fully exposed, moderately exposed, and shaded Cabernet Sauvignon grape clusters approximately three weeks prior to harvest. Each data point represents the mean of three single-berry measurements per cluster. Data were fitted to the following equations: fully exposed $y = -12.9 + 1.4x$, $r^2 = 0.9344$; moderately exposed $y = 1.2 + 0.8x$, $r^2 = 0.9032$; shaded $y = 4.7 + 0.7x$, $r^2 = 0.8273$.

Experimental clusters were selected on shoots of similar vigor, with two-thirds or more of their leaves exposed to full sunlight throughout the study. The experiment was designed as a randomized complete, split plot, with sunlight exposure serving as the main plot and cluster location within the canopy (north versus south side of the vine row) as the subplot. Each treatment was replicated 13 times in both cultivars using single-cluster plots, and all treatments within a replicate occurred on the same vine.

Light measurements

Photosynthetically active radiation (PAR) incident to each cluster was determined at the following stages of fruit development: fruit set (initiation of the experiment; veraison; and several weeks prior to harvest. All measurements were taken near solar noon, on clear, sunny days. PAR was measured using a handheld Li-Cor LI-189 quantum sensor (Li-Cor, Inc., Lincoln, NE), placed in the middle of the cluster, and oriented perpendicular to its plane.

Cluster sunlight exposure was expressed as actual PAR with respect to cluster location in canopy (north versus south side of the vine row) and categorized as follows: less than 10, 10 to 30, 31 to 50, 51 to 100, 101 to 200, 201 to 600, and greater than 600 μmol m^{-2} sec^{-1}. No exposure level greater than 200 μmol m^{-2} sec^{-1} was recorded on the north (shaded) side.

Canopy manipulations (leaf removal or shoot positioning) were performed as needed during the growing season to maintain clusters within +/–10% of their initial sunlight exposure at berry set.

Temperature measurements

Berry temperature was measured between veraison and harvest using a handheld Omega HH23 temperature monitor with dual hypodermic thermocouples (Omega Engineering, Inc., Stamford, CT). Berry temperature was measured by insertion of a thermocouple probe into a berry center. A shielded probe was placed next to the berry to monitor ambient air temperature.

To determine the effects of sunlight exposure on daytime berry temperature, five clusters within each exposure category of both cultivars were selected (all treatments within the same replication). The temperature of three berries on each selected cluster was measured at two-hour intervals from 0600 to 2000 hr., Pacific Daylight Time. Measurements were repeated on the same berries on each cluster throughout the day.

To determine the relationship between sunlight exposure and berry temperature, three berries on 10 fully exposed, moderately exposed, and shaded clusters (30 clusters total) were used. Berry temperature and PAR were measured as described above. Berries used for temperature determinations were removed from clusters and discarded upon completion of measurements.

Fruit analyses

At harvest, berries from the exterior plane (berries facing outward, toward the middle of the vine row) of the clusters were removed, placed in sealed plastic bags, and stored on ice. One hour after harvest, berries were taken to a laboratory and randomly separated into two sub-samples.

One sample consisted of eight berries used for anthocyanin and total phenolic determinations, while remaining berries were reserved for pH, titratable acidity, and total soluble solids determinations. Sample size ranged from 15 to 70 berries for Grenache and 10 to 63 berries for Cabernet Sauvignon.

All samples were weighed and stored in sealed plastic bags at –20°C until analyzed. Frozen berry samples were thawed at room temperature, placed between two layers of muslin, and macerated using a mortar and pestle. The juice was collected in plastic tubes, and soluble solids (°Brix) was determined using a hand-held temperature-compensated refractometer.

Following determination of soluble solids, 5 mL of juice from each sample were placed into a 20 mL vial to which 10 mL of distilled water were added. Titratable acidity was determined by titration with 0.1N of NaOH to a pH 8.2 end point and expressed as g 100 mL^{-1} of tartaric acid. The pH of undiluted juice from each sample was determined using a pH meter.

For anthocyanin and phenolic analyses, samples were removed from the freezer and thawed at room temperature. Berry skins were removed from the pulp by hand, rinsed with tap water, rinsed with distilled water, and then blotted dry with paper towels.

The skins were weighed on an analytical balance, placed in centrifugation tubes containing 50 mL of acidified methanol (1% HCl, v/v), and stored in darkness for 48 hours. After appropriate dilution with acidified methanol, the absorbance of a 5 mL aliquot of the extract was determined at 520 nm using a spectrophotometer (Spectronic, Rochester, NY).

Anthocyanin concentration (expressed as mg pigment g^{-1} of berry skin) was determined using the molecular weight (529) and molar absorbance (28,000) values for malvidin-3-glucoside.[1] A 10 mL aliquot of the above extract was collected to determine total phenol content by the modified Folin-Ciocalteu method.[18] Total phenol content was expressed as mg of gallic acid g^{-1} of berry skin.

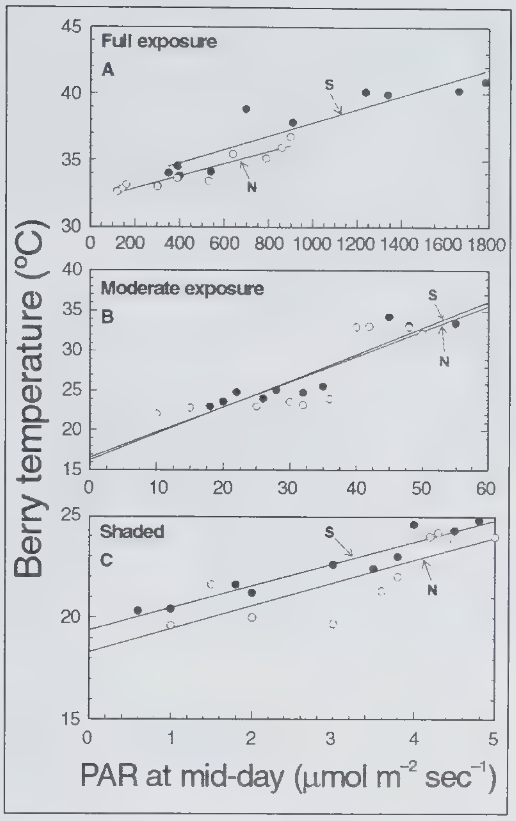

Figure II Relationship between PAR and the berry temperature of fully exposed **(A)**, moderately exposed **(B)**, and shaded **(C)** Cabernet Sauvignon clusters located on the north (N) or south (S) side of canopy at mid-day two weeks prior to harvest. Each data point represents the mean of three, single berry measurements per cluster. Data were fitted to the following equations: fully exposed N: $y = 32.7 + 5.0x$, $r^2 = 0.8420$; fully exposed S: $y = 32.0 + 4.6x$, $r^2 = 0.8880$; moderately exposed N: $y = 16.2 + 0.3x$, $r^2 = 0.8662$; moderately exposed S: $y = 16.5 + 0.3x$, $r^2 = 0.6964$; shaded N: $y = 19.4 + 1.1x$, $r^2 = 0.9219$; shaded S: $y = 18.3 + 1.1x$, $r^2 = 0.6683$.

Statistics

Relationships among cluster light exposure and berry temperature, growth, and composition were examined using general linear modeling and curve fitting procedures in SAS (SAS Institute, Cary, NC). Homogeneity tests in SAS were used to determine if regression relationships differed significantly (p less than 0.05) for clusters on each side of the canopy.

RESULTS

As expected, daytime berry temperature was greatest in fully exposed clusters and lowest in shaded clusters (Figure IA). The mid-day temperature

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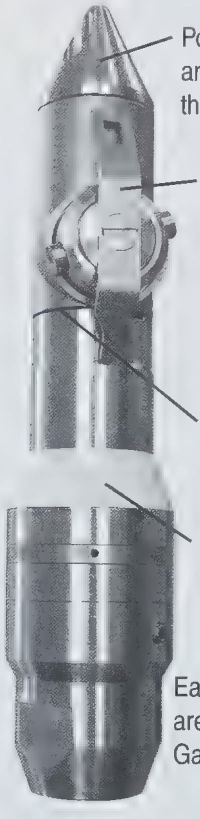
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of fully exposed berries exceeded ambient air temperature by 7°C, and that of shaded berries by nearly 10°C.

Fully exposed clusters exhibited the largest fluctuation in daytime berry temperature among treatments, and shaded clusters exhibited the least. Berry temperature of all sunlight exposure classes correlated closely with air temperature near the cluster (Figure IB).

The berry temperature of fully exposed clusters increased more quickly with ambient air temperature than moderately exposed or shaded clusters, reflecting the greater radiation incident to their surface. Berry temperature increased linearly with incident PAR for clusters in all exposure classes (Figure II).

When fully exposed or shaded clusters received the same sunlight exposure, mid-day berry temperature was significantly higher for clusters on the canopy's south side compared to those on the north side ($p < 0.05$; Figures IIA and IIC). In contrast, the berry temperature of moderately exposed clusters on both sides of the canopy rose similarly as PAR increased (Figure IIB). Similar data were collected for Grenache (data not presented).

Berry mass of Grenache increased as mid-day PAR increased up to 51–100 µmol m^{-2} sec^{-1}, then declined for clusters on both sides of the canopy (Figure IIIA). In contrast, the mass of Cabernet Sauvignon berries increased linearly with sunlight exposure for clusters on the canopy's north side (Figure IIIB). Berry mass on the canopy's south side declined slightly with increased sunlight exposure and was lower compared to berry mass on the north side ($p < 0.05$).

The soluble solids of Grenache increased with greater sunlight exposure, then declined when mid-day PAR exceeded 31 to 50 and 51 to 100 µmol m –2 sec –1, respectively, for clusters on both sides of the canopy (Figure IVA). Compared to clusters on the north side, soluble solids were higher for clusters on the canopy's south side when mid-day PAR exceeded 51 to 100 µmol m –2 sec –1 ($p < 0.05$).

Soluble solids of Cabernet Sauvignon on the south side increased sharply when mid-day PAR increased from less than 10 µmol m^{-2} sec^{-1} to 10–30 µmol m^{-2} sec^{-1}, then leveled off (Figure IVB). In contrast, sunlight exposure had little effect on soluble solids of clusters on the canopy's north side, and the fruit was generally lower in percent soluble solids compared to clusters on the south side ($p < 0.05$).

Continued on page 71.

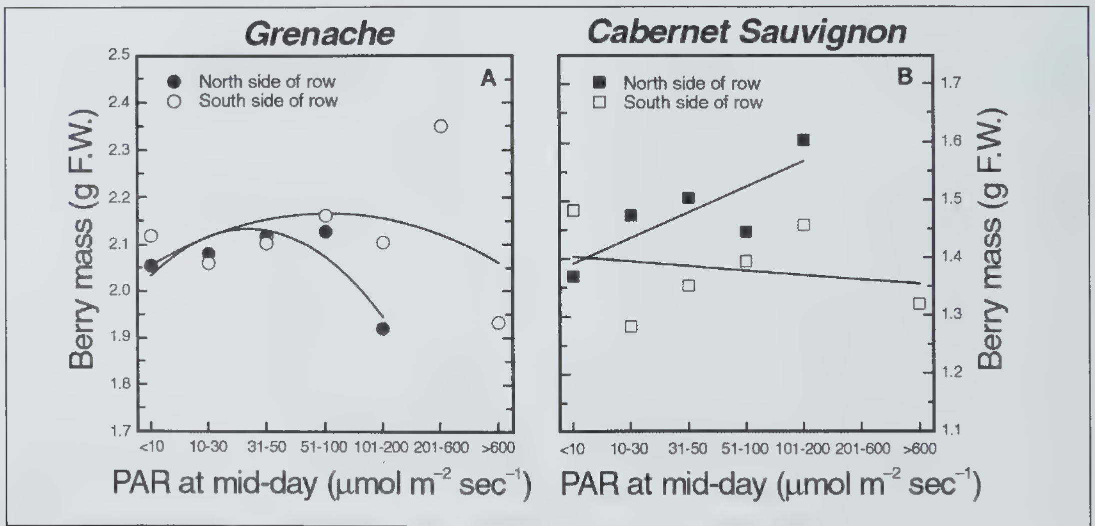

Figure III Influence of cluster sunlight exposure on berry mass of Grenache **(A)** and Cabernet Sauvignon **(B)**. Clusters were grouped according to the following sunlight exposure classes: <10, 10–30, 31–50, 51–100, 101–200, 201–600 and >600 µmol m^{-2} sec^{-1} PAR. Data were fitted to the following equations: Grenache: north side of row $y = 2.034 + 0.119x - 0.035x^2$, $r^2 = 0.800$; south side of row $y = 2.055 + 0.073x - 0.012x^2$, $r^2 = 0.130$. Each data point represents the mean of at least two replicates, except for exposure class 201 to 600 µmol m^{-2} sec^{-1}, which has only one. Cabernet Sauvignon: north side of row $y = 1.392 + 0.044x$, $r^2 = 0.661$; south side of row $y = 1.404 - 8.528 \times 10^{-3}x + 7.542 \times 10^{-5}x^2$, $r^2 = 0.049$. Each point represents the mean of at least three replicates; no clusters were present in the 201-600 µmol^{-2} sec^{-1} exposure class on the canopy's south side.

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Photo by Fred Lyon

Salad with Wine? Why not?

BY Catherine Fallis

Life was so much less complicated when salad was iceberg lettuce and tomato wedges with Russian or Green Goddess dressing, and wines were modeled on the everyday table wines of Europe — pleasantly fruity, medium to high palate-cleansing acidity, straightforward, and unoaked. Today, American cuisine is increasingly complex while its wines grow less and less food-friendly.

Trying to match a typical viscous, alcoholic, overtly oaky wine with a salad that may have 20 ingredients, plus the dressing, is as challenging as finding the perfect human companion. An opulent, buttery, vanilla-cream Chardonnay may have immediate appeal, but on closer examination, the very factors that make the wine pleasing by itself become the factors that destroy the potential match.

Still, though the task may appear daunting, by taking the components of salad and wine into consideration, you'll be on your way to satisfying pairings.

Building blocks of salad

Begin with the greens. As described in *The Good Cook Series, SALADS* (Time Life Books, Virginia, 1980, with Chief Series Consultant Richard Olney):

> Start with the basic resource, mild flavored greens. Add assertive leaves for tangy effects, a spectrum of vinegars and oils, vegetables and fruits, cooked vegetables, meats and poultry, fish and shellfish, noodles, cheese, eggs, grains … More than any other part of the menu, a salad invites the play of artful imagination, … it may be as casual as a bowl of lettuces … or as structured as medallions of salmon encased in shimmering aspic. Salads may, in fact, include almost any food known to cookery, in a near-infinitude of guises and arrays.

In his book *The Cuisine of Hubert Keller,* Chef Keller describes the mixed salads of the South of France, including that region's typical mesclun, "a mix of young greens and lettuces such as oak leaf, mustard greens, Bibb, radicchio or treviso, frisée, spinach, and arugula … This variety gives a combination of flavor, color, texture, and spiciness."

Here we are at the very foundation of salad making — the green or lettuce — and we are already looking at a panoply of flavors (ranging from bitter to less bitter, herby, and spicy) and at textures (mainly crispy or crunchy or chewy) that will come into play in a big way when bringing wine into the equation.

It is no wonder that — aside from the wine geek with too much time on his hands or the occasional obsessed chef who has a burning passion for enological pleasures — the average Joe and Jane Doe, not to mention the average server, restaurateur, or winemaker, tend to stay well away from the bothersome task of pairing salad and wine.

But the challenge grows. "While working in the South of France," continues Keller, "I also developed a fondness for the popular nicoise style of salad, full of mixed greens and delicious ingredients, such as potatoes, haricots verts, garlic, onion, olives, capers, anchovies, tuna or other seafood, hard-boiled eggs, and tomatoes." How can you pair a wine with all *these* ingredients?

"I particularly enjoy warm salads," says Keller, "especially those that combine warm and cold elements, effectively releasing the ingredients' fragrances. (Warm salads and vinaigrettes are a feature of contemporary French cuisine; they work on the same principle as hot apple pie served with ice cream.)" Well, hot apple pie á la mode is certainly, a marriage made in heaven, but wine and vinaigrette?

Vinaigrette — a fancy word for oil and vinegar and maybe a little *moutarde* — has the one ingredient that causes the hair on any winery worker's neck to stand on end: vinegar. This same ingredient provides perhaps the greatest challenge of all when it comes to finding a companionable glass of vino for your salad.

CHEF HUBERT KELLER, whose restaurant Fleur de Lys is in San Francisco, CA, demonstrates the principle of balancing heat and sweet in this bright refreshing salad.

Spicy Melon and Grapefruit Salad

This is certainly a healthful salad, and the combination of mint, grapefruit, and melon — will get those taste buds and appetites geared up for the rest of the meal. Black pepper goes well with many different kinds of fruit, and in this recipe, its heat is balanced by the sweetness of the fruit and wine.

Serves: 4

1	fully ripe cantaloupe melon, cut in half and seeded
½	fully ripe honeydew melon, cut in half and seeded
1	grapefruit, peeled and sectioned
12	fresh mint leaves
¼	teaspoon freshly cracked pepper, or to taste
½	cup dessert wine, such as Sauterne, California late harvest Sauvignon Blanc, or Semillon

Using a melon baller, scoop out the flesh of each melon and place in a mixing bowl. Add the grapefruit sections. Cut four of the mint leaves into chiffonade, using sharp scissors so the leaves are not bruised, and add to the mixing bowl together with the pepper and wine. Gently toss all ingredients together. Cover the bowl with plastic wrap and refrigerate for at least one hour (and up to 24 hours).

To serve, divide the salad equally among four salad bowls. Spoon the liquid in the mixing bowl over the fruit and garnish with remaining mint leaves.

CHEF'S NOTES:

Allow about 15 minutes to prepare and at least one hour to chill. This salad is an eye-catcher served buffet style, and it also looks particularly striking when served in black china bowls.

Recommended wines: A Sauterne wine, a California late harvest Sauvignon Blanc, or a Semillon.

Fear of vinegar

So, summing up, we have the greens as basic salad building blocks. There are "other ingredients" ranging from soup to nuts, and the dressing, most commonly with a base of oil and vinegar. What's a gourmet to do? (Look over the lists below.)

SALAD COMPONENTS TO CONSIDER

Greens
Leaves
Other vegetables
Fruits

Ingredients with Fats:
Nuts
Cheeses
Proteins (fish, beef, pork, poultry)

Dressings:
Oils
Vinegars
Mustards
Spices
Seasonings

Theme Influences:
French
Italian
American
Asian fusion
Spanish

WINE COMPONENTS TO CONSIDER

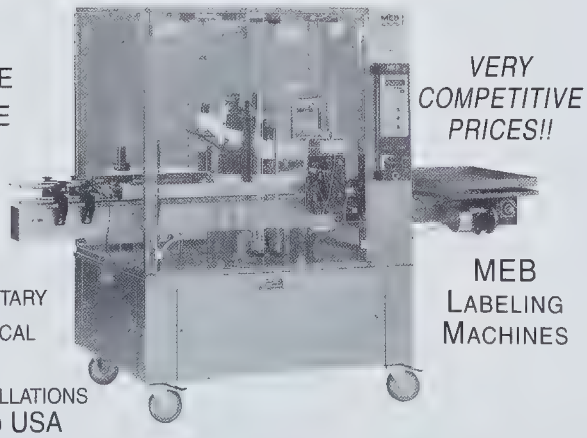
Fruit
Dryness/sweetness
Acid

Alcohol
Oak tannins
Fruit tannins

Meeting the challenge

Simply put, the more complex the salad, the simpler, lighter, and cleaner the wine should be. In this case, go for palate cleansing as the main goal. A simple dish won't overpower a complex wine. High fat in the dish calls for high acid in the wine (think eggs and bacon with orange juice).

Heat in the dish calls for lower alcohol in the wine. Bitter greens may clash



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with bitter wood or fruit tannins. High acid dressings will clash with high acid wines. A tart wine becomes unpleasantly tart when paired with a dish that has sweet ingredients.

Would you sit down to a plate of pancakes with butter and maple syrup and ask for a milkshake? Probably not. Rich and rich, in this case, is not a good match. According to *101 Essential Wine Tips* (DK Publishing, Editor, Leslie Malkin, 1997), "If there is lemon or vinegar in the dressing, wine should be more acidic to balance it. Light, dry whites, more acidic than reds, suit salads: Sauvignon Blanc is a good choice."

This is all fine and good if you are shopping for wine in London, where the chance of encountering a typical, heavily oaked American Sauvignon Blanc is slim to none. I also tend to disagree with the theory of mixing acid with acid. If there is a predominant streak of lemon or vinegar, I would select a lower acid, fruit-forward wine (Colombard, anyone?).

Going back to the comfort zone of food, consider this: a bowl of tomato soup with a glass of cranberry juice. To me, pairing the light, slightly sweet, and acidic soup with a mouth-puckering beverage has about as much sex appeal as eating gelfite fish right out of the jar. This is exactly the same idea as the wine pairing. It boils down to a simple sensual reaction. Either you are going to like it, or you are not.

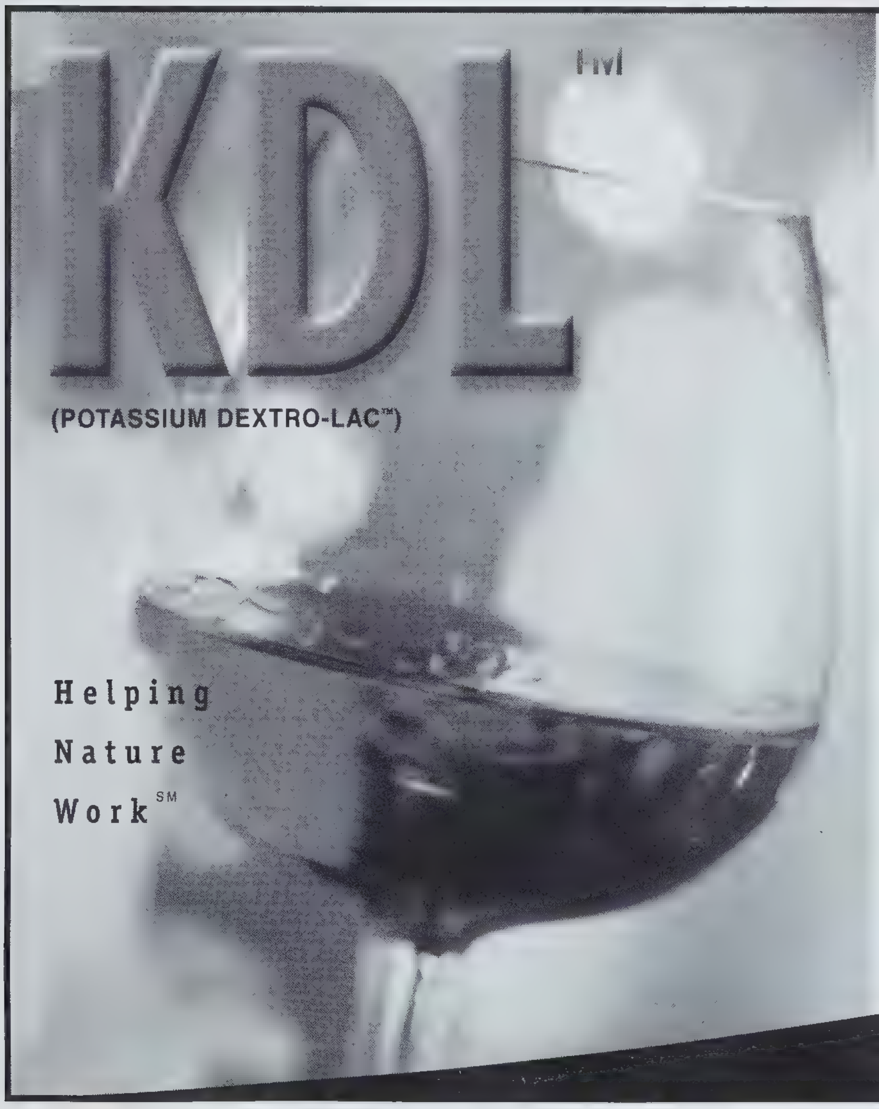
Chef Cal Stamenov and Cellarmaster Mark Jensen of Bernardus Lodge in Carmel Valley, CA, recently created a menu for an "organic" dinner, featuring wines made with organically grown grapes paired with organic produce, game, and dairy products. Jensen paired Iron Horse Vineyards 1996 Classic Brut, Sonoma, with Chef Stamenov's salad of zucchini blossoms stuffed with fresh goat cheese and dressed with lemon basil oil.

The Iron Horse sparkling wine was delicate enough not to overpower the subtle blossoms and accentuated the sweetness and creaminess of the chevre. The same wine was served with tomato "Jello Shooters" with bronze fennel and cucumber. The shooters had the look and texture of ahi sashimi, and the bubbly served as a refreshing palate cleanser.

Conclusion

As with other facets of life, balance is the key to a good match. Applying the same principles to this task as you do to the matches you already make three times each day (at breakfast, lunch, and dinner) will help you reap the rewards of pleasing your palate.

Of course, France — the food and wine benchmark for the world – solves the problem by serving the basic side salad after the entrée and before the cheese course as an *intermezzo* — a palate cleanser — on its own, without wine. Now there's a thought. ■



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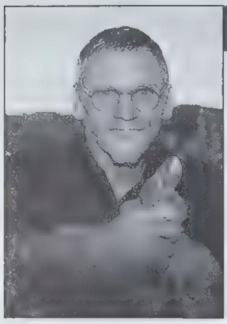

SMART VITICULTURE *by Dr. Richard Smart*

Central Coast report on Smart-Dyson trellis

Over the last few years I have heard reports from growers and winemakers on the Central Coast of California about the performance of the Smart-Dyson trellis. There is probably more Smart-Dyson trellis on the Central Coast than anywhere else in the world, which seems fitting since the system was first evaluated in Gilroy, just south of San Jose.

In May 2002, I interviewed growers and winemakers with experience using the trellis. Since the "Smart" in Smart-Dyson is indeed yours truly, I was intent on directly obtaining a field report to ascertain the effectiveness of the trellis, and to solicit perspectives that could help others contemplating a change in their trellis system.

Interviewees are Dana Merrill of Mesa Vineyard Management, Templeton; Bill Petrovic of San Bernabe Vineyards, King City; Matt Heil (winegrower relations) and Jeff Kasavan (winemaker) of Robert Mondavi, San Luis Obispo.

Chalk Knoll Vineyard

This 335-acre vineyard at San Ardo, south of King City in Monterey County on Highway 101, managed by Mesa Vineyard Management, was planted beginning in 1996, with Merlot grafted to 3309C, Sangiovese on 101–14, and Cabernet Sauvignon also on 101–14. Since hill soils were largely calcareous, SO4 rootstock was planted on some of the acreage. Syrah was planted in 1998.

Vine spacing was 10 ft x 5 ft. The vineyard is all drip-irrigated. Cordons are 46 inches above ground. Additionally, there is overhead frost protection utilizing a pulser system with a second drip line.

I asked Dana Merrill why a 10-foot-wide tractor-row spacing was used. Merrill replied that it was because of existing harvesters and the presence of some steep slopes. The 10 x 5 planting was also considered a similar density to 8 x 6 density.

Merrill reports the modern trend is towards 8-foot tractor rows. It was his feeling that the 8-foot tractor row would have reduced the plantable acreage so that the production decrease from wider rows was more than offset by being able to plant steeper slopes with 10-foot tractor rows.

Why did Mesa Management choose the Smart-Dyson trellis? This system was chosen by Mesa Management for the following reasons:

1) A vertically-trained vineyard was desired.

2) It was an advantage since a pulser system was being used for spring time frost control. This system puts out a stream of water droplets with a 24-inch wetting diameter.

3) Better mechanization options for the future and more efficient to machine harvest. Although "quality oriented," this vineyard still could not likely afford long-term reliance on hand labor.

4) Better air circulation and spray penetration. "VSP alone had proven too limiting for shoot positioning for Cabernet Sauvignon, Syrah, and Sangiovese especially," says Merrill. "Smart-Dyson doubled the 'areas' available with which to space out the canopy, and solved the excessive crowding problem which was evident on our VSP vineyards."

The vineyard is machine-harvested. In the opinion of the vineyard management team, the system picks better than most. "It does a beautiful harvest job," says Craig Wyatt, vineyard manager at Chalk Knoll. Because canopies are so open, spraying is very effective, using a low volume electrostatic unit.

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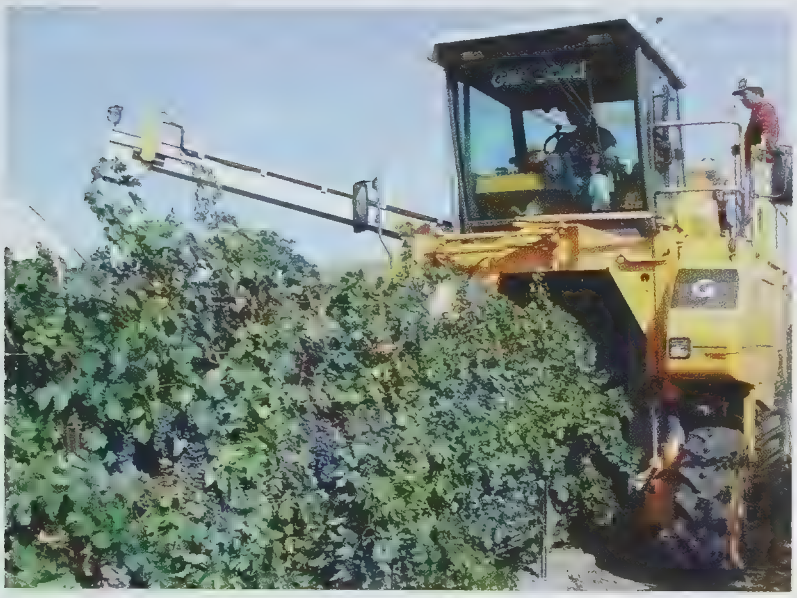

Smart Dyson trellis being mechanically harvested. (Photo by Dana Merrill.)

Pruning is also simple — and cost-effective. The hand pruning cost is now about $180 per acre, with labor at around $10 per hour (including fringe benefits). Labor input is therefore about 18 hours per acre, about standard for hand spur-pruning with vertical shoot positioning (VSP). In the future, mechanical pre-pruning will be done.

Vines are pruned to around 40 to 50 buds, which is an equivalent spacing of four to five buds per foot **each** for the top and bottom fruit zones of the canopy, or four to five buds per foot of canopy. (There are two feet of canopy per foot of row, one for the top and one for the bottom).

Wind assists in shoot positioning

The Salinas Valley is a windy place. Winds come up every day about 1 PM, and can blow until late at night. The wind direction is constant, being north-east to south-west. The rows at Chalk Knoll run north-south.

Awareness of the wind was a dominant factor in foliage wire location. Normally I suggest two pairs of moveable foliage wires above the cordon, one at the top of the stake, and one midway to the cordon. There is one moveable foliage wire which is used to position shoots downward. This standard pattern was not necessary at Chalk Knoll.

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"We soon discovered that we could get away with three fixed foliage wires above the cordon," reports Greg Hibbits, general vineyard manager. "Our crew would put the shoots between the wires, and the wind would do most of the work." Both Hibbits and Wyatt agree that this system is particularly well-suited for this vineyard.

Two wires are on the downwind side; one at the top of the post (72 inches high), and one about eight inches above the cordon at 54 inches above ground. The one wire on the upwind side is 62 inches above ground.

Shoot positioning requires two passes only, which are done in early June, just after bloom. The first pass consists of putting the moveable foliage wire on top of those shoots that will go downward to the east, and it is pegged on each second or third stake. Shoots are also put between wires on the top.

The second pass moves the downward shoot positioning wire to its location about 16 inches below the cordon, where it is attached at every post. This completes the downward shoot positioning. About one-third of the shoots are positioned downward, the rest upward.

Shoot positioning the Smart-Dyson is not expensive. Costs of the operation are $100 per acre, based on about 10 hours of work at $10 per hour. These costs are similar to VSP shoot positioning.

Because the Smart-Dyson creates open canopies, there is no need for leaf pulling, and less shoot thinning is required. These benefits translate to significant cost savings. There is also minimal hedging or trimming required. Only a portion of the Cabernet Sauvignon had any summer trimming, either lower canopy skirting or topping.

For areas within the vineyard where there is less vigor, the lower shoots are eliminated, and the system becomes a VSP.

Good yields, great wine

Vineyard yields range from 5 to 8 tons per acre. In 2001, Merlot and Cabernet yielded slightly more than 8 tons per acre, and the first crop of Syrah was 3.9 tons per acre.

The vineyard has moderate vigor, and has very good fruit exposure. A little sunburn was noticed in the first crop year, but not since the canopies were established. Long-term yields for Merlot will likely average 6 tons per acre, slightly higher for Cabernet, Sangiovese, and Syrah, reports Merrill.

I spoke to Jeff Kasavan, winemaker for the Robert Mondavi Private Selection. Kasavan is the sort of winemaker who assesses the wine before applying judgements about the vineyard. If the wine is good and the yield is high, then that is fine. The more good wine the better.

Kasavan is enthusiastic about Chalk Knoll fruit. He has processed it since 1997, and the wine has been good every year. Wine from the 2001 vintage was among the best in the cellar.

"The color and flavor were both stand-out," he says. "We are more interested in fruit exposure than yields. The wines have

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The vines are of moderate vigor, and well-suited to the Smart-Dyson trellis. Matt Heil of Robert Mondavi has pruning weights for the Chalk Knoll Merlot that are about 1.6 kg (3.5 lbs) per vine. Expressed as per unit row length, the values are 1.1 kg/m row length (0.7 lb/ft), which are in the range where a change to a divided canopy such as the Smart-Dyson is beneficial.

Similar experience at San Bernabe

Bill Petrovic had his first experience with the Smart-Dyson system in 1996. He now regards it as his preferred system, having replanted about 3,000 acres to it over the years. Petrovic reports similar costs to Chalk Knoll for shoot positioning. Leaf pulling costs about $120 per acre per side, so avoiding this cost is a real savings.

Pruning is cheaper than for VSP, because there is no need to use kicker canes to boost bud number for vine balance. Petrovic finds that the Smart-Dyson is easy to machine- and hand-pick, and there is less fungal disease.

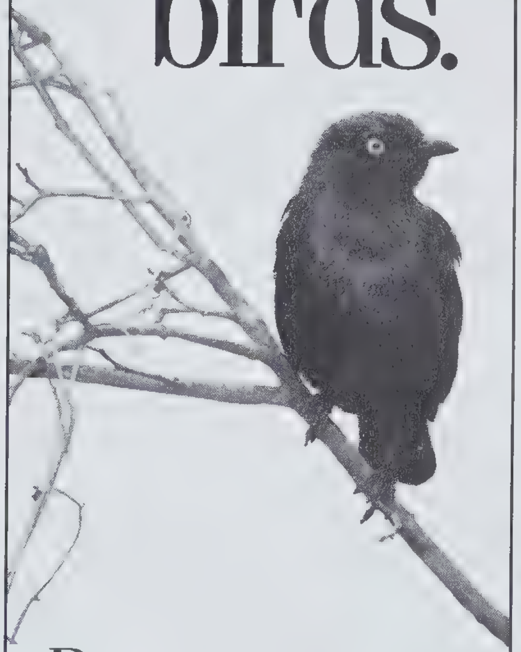
Conclusion

A final tip from Dana Merrill: "Make sure that your crew members do not cut off downward facing spurs during vine training! Once the crews become familiar with the Smart-Dyson, they like the system."

These endorsements from prominent growers and winemakers indicate the benefits of the trellis system. I still see too many vineyards using VSP when the vigor is too high. In these vineyards, both yield *and* quality would be improved by converting to Smart-Dyson.

Is yours perhaps one of them? ■

Dr. Richard Smart, "the flying vine-doctor," is an international viticultural consultant based in Australia. He is also a visiting professor of viticulture at Cal Poly, San Luis Obispo, CA. Contact him by e-mail: vinedoctor@compuserve.com. Read about Dr. Smart's business, including his consulting schedule, educational wine tours, and seminars, at his home page, www.smartvit.com.au. He visits America frequently and his consulting schedule is arranged by Vinquiry in Windsor, CA, tel: 707/838-6312 and www.vinquiry.com.



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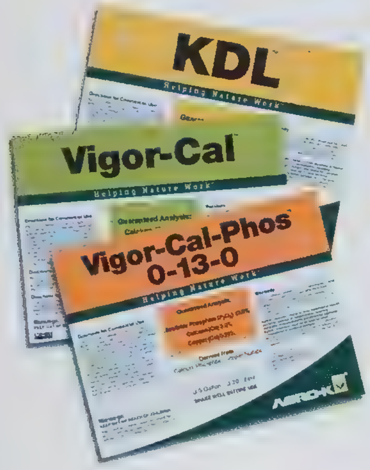

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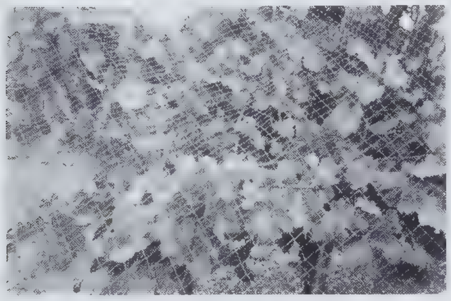

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Lorane Grapevines' specialties are the Dijon clones of Pinot Noir, Chardonnay, and Pinot Gris, plus the nursery's ability to graft to your specific needs. Lorane Grapevines fits hand-in-hand with your company, large enough to fill your vineyard, yet small enough to care.

For more information, contact:
Lorane Grapevines/
King Estate Vineyards
80854 Territorial Rd., Eugene, OR 97405
tel: 800/884-4441 or 541/942-9875
fax: 541/942-9867
website: www.kingestate.com

PLEASE SEE LORANE GRAPEVINES' AD, PAGE 33.

A&P AG STRUCTURES, INC.

A&P Ag Structures, Inc., offers agricultural services and products that assist winegrape growers to achieve increased yields using a variety of innovative structures. The company sells a broad range of products designed to boost production and increase efficiency including trellis systems, grow tubes, and shade houses.

Every A&P product is manufactured from the finest materials. Steel posts are made from rail steel, which is lab-proven superior to all other grades of steel. All wooden posts are dried for three months prior to being treated, and then core-tested for durability after treatment. Even the wire used by A&P has been custom-developed to provide optimum strength and longevity.

During its 26 years of experience in trellis installation, A&P has developed and built the heavy equipment necessary to work efficiently over all terrains and under all conditions. A&P crew supervisors are highly trained and work closely with the grower to ensure complete satisfaction with every field construction project.

For more information, contact:
A&P Ag Structures, Inc.
11266 Avenue 264, Visalia, CA 93277
tel: 559/685-8700; fax: 559/685-8622
e-mail: aandpag@msn.com
website: www.aandpag.com

CALIFORNIA GRAPEVINE NURSERY, INC.

California Grapevine Nursery, certified by the California Department of Food & Agriculture, provides growers with high quality planting materials. Available products include dormant rootstock and dormant grafted vines at very competitive prices.

Choose from 21 varieties of certified rootstock, including the French-developed Gravesac variety. A large selection of scion varieties and clones, including ENTAV-INRA® clones to customize your grafted vine order, is also available. California Grapevine Nursery is a licensed agent of ENTAV-INRA® material in the U.S. with authentic clones from France.

Using state-of-the-art nursery practices, California Grapevine Nursery is not only dedicated to providing customers with the highest quality plants available, but also with excellent, efficient customer service.

For more information, contact:
California Grapevine Nursery, Inc.
1085 Galleron Rd., St. Helena, CA 94574
tel: 800/344-5688; fax: 707/963-1840
e-mail: sales@californiagrapevine.com
website: www.californiagrapevine.com

CAL-PAC

CAL-PAC, an international company, has been in the vineyard-design business for over 20 years and can assist you in development of all your vineyard requirements by offering a variety of ideas for consideration.

CAL-PAC
Specializing in Trellis and Shade Structures

The company's research and development team has been working diligently on its new flat roof systems, D.O.V. systems, shade structures, and insect-screen structures while continuing to update its open-gable system, V.S.P. system, Open Lyre, Modified Lincoln, and Inverted Tattura systems in order to obtain the greatest yield from your crop.

CAL-PAC's Pro-Net bird netting assists customers in limiting the loss of crop to birds with exceptional results. Pro-Net bird netting can be installed and removed with ease.

Please visit the CAL-PAC website at www.cal-pac.com or call an experienced sales representative with your requirements.

For more information, contact:
CAL-PAC
PO Box 25848, Fresno, CA 93729
tel: 559/435-5893; fax: 559/435-3253
e-mail: info@cal-pac.com
website: www.cal-pac.com

SOILWEB, INC.

Soilweb, Inc. finds, independently tests, and supplies scientifically proven, state-of-the-art bio products for soil and foliage that wine growers around the world love, use, and recommend.

Over the last six years, wine growers in Australia and New Zealand have enjoyed a competitive edge in vineyard health and fruit quality by using these bio products developed and tested at universities outside of the U.S. These products are now registered, proven, and available in the U.S., Canada, and Mexico through Soilweb.

Soilweb's "pharmacy" approach to using these and other highly efficacious bio products in designed soils programs adjusts the performance of the root zone ecosystem to dramatically reverse phylloxera decline and reduce counts of pest nematodes by natural mechanisms. This capability is proven and is accomplished through soils programs that use a mix of distinct products that are applied at specific stages of growth, in an affordable protocol. All products are natural, non-toxic, and bio-active in the soil.

Soilweb offers you the full promise of sustainable soil and foliar programs for viticulture. If parts of your vineyards are ragged due to phylloxera or nematode pressure and you want to see them beautiful and bountiful again without need of replanting, or, if you have a healthy vineyard in which you would like to see an exceptional improvement in vitality and performance, call Soilweb today.

For more information, contact:
Soilweb, Inc.
6545 Kings Place, Gilroy, CA 95020
tel: 408/846-1632
e-mail: jb@soilweb.com
website: www.soilweb.com

PLEASE SEE SOILWEB'S AD, PAGE 11.

KINSEY AGRICULTURAL SERVICES

Kinsey Agricultural Services, Inc., provides consulting services for soil fertility management and closely related problems. The foundation work on soil fertility developed by the late Dr. William A. Albrecht, Professor of Soils, University of Missouri/Columbia, provides the supportive soil science applicable to the vineyard and its surroundings.

Whether grapes or ancillary crops, helping growers achieve ideal levels of quality and productivity for soils and crops is paramount. With comprehensive soil tests, recommendations are made paying particular attention to soil condition and nutrient levels (including trace elements). These recommendations will show the proper fertilization recommendation for each crop, and are tailored to the aims and specific situation applicable to each grower.

Kinsey neither recommends nor strives to convince clients to use any particular fertilization methods. Consultations are provided to help understand the consequences of mineral excesses and deficiencies in the soils and solutions to the problems they cause. Consequently, Kinsey works with conventional, certified organic, and natural growers.

Kinsey does not sell fertilizer. The company specializes in recommending exact products needed to attain top quality and desired yields.

Training programs on building soil fertility conducted for growers, consultants, and companies can be found at www.kinseyag.com. Training is utilized to help clients understand fertility requirements of the soils they are working to build, and to teach why it is important to employ specifically recommended materials for each growing area.

For more information, contact:

Kinsey Agricultural Services, Inc.
297 Co. Hwy. 357, Charleston, MO. 63834
tel: 573/683-3880; fax:573/683-6227
website: www.kinseyag.com

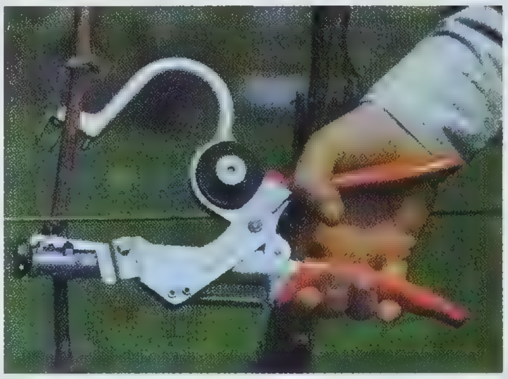
PLEASE SEE KINSEY'S AD, PAGE 22.

TAYLORED PRODUCTS CO.

Designed 26 years ago and tested in the cold winters of Germany, the Beli-Binder "has proven to be the fastest, easiest, and most efficient tool for tying hardwood canes in the vineyard," says Jim Taylor of Taylored Products Co.

The Beli-Binder, a product of German engineering, is made of inoxidizable duralumin (the wearing parts are of high-quality refined and hardened steel), which makes this tool virtually indestructible and easy to repair if needed.

It uses a spool of special, mechanically wound steel wire that lasts the season and decomposes into the soil. One lubricated spool has 240 feet of wire, will make 800 to 1,000 ties, and will not jam the tool.



The Beli-Binder was designed for use with one hand, leaving the other hand free to work with canes. Its design allows for easy, comfortable use with gloves in cold weather. The basic operation is to pass over the wire and cane, close/open, pull back to operator side of wire and cane, close/cut/open, pull back on tool and release it. This places three twists in binding wire, attaching the cane to the trellis wire.

Trials have reported labor savings of from 25% to 50% in different vineyards (specific information available) over present tying methods.

Beli-Binders are now available at vineyard supply dealers throughout the U.S. or by calling 209/810-4630.

PLEASE SEE TAYLORED PRODUCTS' AD, PAGE 56.

SONOMA GRAPEVINES

Sonoma Grapevines is a California-certified nursery with over 30 years of experience producing high-quality certified varieties and clones for the wine industry.

Each clone, like everything produced by the nursery, is carefully handled and coded to maintain its true identity and source throughout the grafting and growing processes. All clones are treated as unique and different varieties.

Sonoma Grapevines specializes in production of certified dormant benchgrafts, dormant rootstock, scion rootings and cuttings, and other related products. By implementing innovative techniques, the nursery's new management plans to improve its already solid reputation of offering only the highest quality grapevines.

Sonoma Grapevines' personnel have the ability to effectively deal with customers' needs in California (locations in Sonoma and Kern counties), across the U.S., and worldwide. The company is committed to providing customers not only with high-quality grapevines, but also high-quality customer service. Call or stop by Sonoma Grapevines' customer service office in Santa Rosa, CA, to speak with one of its knowledgeable sales staff.

For more information, contact:

Sonoma Grapevines
1919 Dennis Ln., Santa Rosa, CA 95403
tel: 707/542-5510; fax: 707/542-4801
website: www.sonomagrapevines.com

PLEASE SEE SONOMA GRAPEVINES' AD, PAGE 10.

PEACEFUL VALLEY FARM SUPPLY

Peaceful Valley Farm Supply was one of the first, and is now one of the largest organic suppliers to California growers.

For over a quarter of a century, Peaceful Valley Farm Supply has provided growers with cutting-edge products, personalized advice unsurpassed in the industry, competitive prices, and first-class service. While many of the company's vineyard customers are not organic per se, they often use some of the proven methods and products that certified organic growers rely on.

www.GROWORGANIC.com
Est. 1976
PEACEFUL VALLEY FARM SUPPLY

One of Peaceful Valley Farm Supply's proprietary products, Brix Mix, uses foliar feeding technology to enhance plant health and crop quality. It contains a cornucopia of natural substances that have been refined by more than 20 years of research. It was designed based on the fact that sugar levels can be significantly increased in the plant after feeding with this nutrient-rich, biologically diverse product.

In addition to offering a wide array of organic fertilizer and pest control materials, Peaceful Valley Farm Supply has a huge selection of annual and perennial cover crops, including wildflowers. For a complete look at the company's product line or to order its 136-page catalog, visit www.groworganic.com.

For more information, contact:
Peaceful Valley Farm Supply
PO Box 2209, Grass Valley, CA 95945
tel: 888/784-1722
e-mail: contact@groworganic.com
website: www.groworganic.com

PLEASE SEE PEACEFUL VALLEY AD, PAGE 41.

GALO MACLEAN NURSERY

Galo MacLean Nursery offers more than 27 years of nursery experience and provides technical advice on rootstock selection based on site. The nursery specializes in first-quality, certified, dormant rootings of rootstocks and dormant benchgrafts.

Rootstock varieties available include: 110R, 1103P, Teleki 5C, Kober 5BB, 101-14MG, 3309C, S04, and 140R.

Benchgrafts are made under contract to customer specifications.

Galo MacLean offers crucial expertise, based on a background including degrees in enology, viticulture, agrichemistry, and soil microbiology.

For more information, contact:
Galo MacLean Nursery, Inc.
2160 Cuttings Wharf Rd., Napa, CA 94559
tel: 707/255-8874; fax: 707/255-4579

VESTRA RESOURCES

Maps and digital information provided by VESTRA Resources, Inc., are suitable for use in a GIS (Geographic Information System) or as GIS analysis and maps. VESTRA delivers services, GIS software and training, and a line of GIS-ready imagery products.

VESTRA's information products are used to aid vineyard management, especially in increasingly complex rootstock and microclimate sites, for harvest plans, and to market premium winegrapes.

On the winery or management side, uses of VESTRA products include development of proposed American Viticultural Areas, wine education and wine marketing, and combining winemaking information with vineyard information. VESTRA's AVA map products can be customized to show vineyard and winery locations.

VESTRA offers GIS-ready multispectral or black and white imagery acquired by airplane or satellite. Digital multispectral image analysis has proven useful in the field for identifying areas of vigor and stress in the vineyard. Aerial photos with survey control and two- or five-foot contours are useful for vineyard development/redevelopment, erosion control planning, in GIS as-built maps, historic records, and for future analysis.

VESTRA brings the best of the information technology world to the wine industry and can teach you how to use information to benefit your business.

For more information, contact:
VESTRA RESOURCES
962 Maraglia St., Redding, CA 96002
tel: 530/223-2585; fax: 530/223-1145
e-mail: jamie@vestra.com
website: www.vestra.com

TURF-SEED, INC.

Turf-Seed, Inc., offers new, Roundup-tolerant grasses to help control weeds and erosion in vineyards.

Aurora Gold Hard Fescue and Pure Gold Tall Fescue are two new perennial cover crop grasses from Turf-Seed, Inc. The grasses have been bred using natural plant breeding techniques and are not genetically modified plants.

When planted between vine rows, these grasses will help control weeds, soil erosion, and dust, and create a work platform for machinery in the vineyard. In addition, these grasses are tolerant to low rates of Roundup herbicide, which can be used as an "over the top" spray to control weeds, weedy grasses, and invasive species, without damage to the cover crop. If necessary, Aurora Gold and Pure Gold can be eliminated using full rates of Roundup.

Aurora Gold is a non-creeping fescue that will not spread into unwanted areas. Because it is shallow rooted, it can be used in poor soils and will not compete with vines for water and nutrients. Aurora Gold is low growing and shade- and drought-tolerant.

Pure Gold is a deep-rooted variety that is best used in vineyards where it is necessary to reduce vine vigor. It is also a non-creeping type.

Bloomers Wild Flower Mixture is also offered by Turf-Seed, Inc. for improving and beautifying low maintenance areas around winery buildings, tasting rooms, roadsides, and steep slopes.

For more information, contact:
Tom Stanley, Turf-Seed, Inc.
1741 Santa Ynez St., Ventura, CA 93001
tel: 805/641-9911; fax: 805/641-9912
e-mail: tom@turf-seed.com
website: www.turf-seed.com

CALDWELL NURSERY, INC.

Caldwell Nursery, Inc., situated in the heart of Napa Valley, is known for its expertise in French clones. The nursery offers French ENTAV-INRA® clones and rootstocks, greengrowing and dormant rootstocks, and grafted vines. New clones of Cabernet Sauvignon, Merlot, Syrah, and Cabernet Franc are available. Caldwell Nursery offers dormant spring budwood and fall-fresh budwood for field-budding.

John Caldwell is the author of a second edition of the *Concise Guide to Wine Grape Clones for Professionals*, providing information on wine trials with respect to soil, climate, and rootstock choices on French, Italian, and American clones.

The book is based on 15 years of research, beginning with Caldwell's first trip to Bordeaux, where he was introduced to a clonal program. The book came about because Caldwell wanted to provide an intellectual base for making clonal decisions. "We need to know why we use clones," says Caldwell.

Caldwell also provides consulting on vineyard planning and clonal decisions.

For more information, contact:
Caldwell Nursery, Inc.
169 Kreuzer Ln., Napa, CA 94559
tel: 707/255-1294; fax: 707/255-5162

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Starting vines with a healthy, strong root system leads to many other benefits such as generating early growth response, promoting plant longevity and productivity, creating more efficient use of water and fertilizer, and allowing for more rootstock choices.

To order the FREE guide, *Managing Nematodes and "Replant Disease" with Soil Fumigation,* call 888-395-PEST. Visit www.dowagro.com for a listing of Telone sales specialists in your area.

For more information, contact:
Dow AgroSciences LLC
9330 Zionsville Rd.
Indianapolis, IN 46268-1054
tel: 800/258-3033
website: www.dowagro.com

PLEASE SEE DOW AGROSCIENCES' AD, PAGE 18.

SUNRIDGE NURSERIES

Sunridge Nurseries offers a new plant protector that is an affordable way to protect young vines from herbicide sprays, small animal feeding, and wind damage.

When planting dormant vines, the top of the plant protector can be closed, which simulates a humid greenhouse environment, enabling the vine to push buds without drying out.

Mounding is a good way to help keep the vine buds from desiccating while roots are taking hold, but is costly and not always effective. Sunridge Nurseries' plant protectors can take the place of expensive mounding. This new method of sealing the top of the plant protector mimics mounding and lowers labor costs. Once the root takes hold and the vine buds push, the plant protector can be opened or unsealed quickly, no shovel needed, and can simulate a common grow tube.

For more information, contact:
Sunridge Nurseries
441 Vineland Rd., Bakersfield, CA 93307
tel: 661/363-VINE (8463); fax: 661/366-4251

PLEASE SEE SUNRIDGE NURSERIES' AD, PAGE 34.

SPEC TRELLISING

Spec Trellising is all about quality. For critical applications such as grapevine trellising, Spec believes that only high-quality, long-lasting materials should be used. The company's goal is to develop long-term relationships with all of its clientele and works hard to do this. Affordably priced, high-quality products combined with unbeatable service serve as Spec's recipe for success.

To help achieve its goal, Spec has added some new, innovative products to its grape trellis product line. The Spec product line includes metal and wood posts, Zalcote vineyard wire, the Wirelock Wire Joiner, and Wirelock Trellis Anchor, the SnapMax™ Vine Shelter, Bahco™ pruners, snips and loppers, and the Prothec System ™ for vine tying.

The new Spec product offering is actually not a grape trellis product, but a winemaking product, and is perhaps the most exciting new product to hit the winemaking market in years — the revolutionary Fermentabag™. A flexible fermentation cell, the Fermentabag (250-gallon capacity) is a disposable fermentation product, which eliminates punch down and pump-over that is normally required for red wine fermentation. Improved color extraction and enhanced flavor are obtained through the Fermentabag process, at a fraction of the cost of stainless steel.

For high-quality, affordably priced grape trellis materials and the Fermentabag, call Spec Trellising.

For more information, contact:

Spec Trellising
39 Indian Dr., Ivyland, PA 18974
tel: 800/237-4594 or 215/322-5588
fax: 215/357-3122
e-mail: info@spectrellising.com
website: www.spectrellising.com

PLEASE SEE SPEC TRELLISING'S AD, PAGE 40.

DUARTE NURSERY, INC.

Choose Duarte Nursery Big Pot Benchgrafts for your vineyard; measure the quality by their performance. Duarte backs Big Pot Benchgrafts with a guaranteed stand and offers free delivery in most of California and Oregon.

Duarte offers one of California's best vineyard service teams. A Duarte viticultural consultant is available to provide sales and service throughout California and Oregon grapegrowing regions.

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For more information, contact:

Duarte Nursery, Inc.
1555 Baldwin Rd., Hughson, CA 95326
tel: 209/531-0351 or 800/GRAFTED
fax: 209/531-0352
e-mail: sales@duartenursery.com
website: www.duartenursery.com

PLEASE SEE DUARTE NURSERY'S AD, PAGE 47.

VINEYARD WATER SYSTEMS

Vineyard Water Systems specializes in providing grapegrowers with practical solutions to drip and micro-irrigation challenges.

VINEYARD •WATER• SYSTEMS

Both partners of Vineyard Water Systems, Lizanne Wheeler and Patrick Brown, are experienced in the winegrape industry as licensed pest control advisors, certified crop advisors, and certified irrigation designers which gives them a unique perspective in irrigated vineyard management.

In addition to helping growers create new projects by providing irrigation designs and bid reviews, they are also able to apply their experience to management of existing systems. Both are skilled as bilingual trainers and can provide customized training to vineyard irrigation management teams.

Addressing the issue of filter maintenance, fertigation and chemigation, water chemistry, emitter plugging challenges, and system automation are all within the realm of their experience.

When it comes to addressing the challenges of applying the appropriate amounts of water and nutrients to your vines in a safe and economical manner, you can make your management team as efficient as possible by calling Vineyard Water Systems, the vineyard irrigation specialists.

For more information, contact:

Vineyard Water Systems
521 Lucerne Rd., Cayucos, CA 93430
tel: 805/995-0587; fax: 805/995-0205
website: www.vineyardwater.com

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bio
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In winegrape trials, applications of CERES and LiquiComp showed increased pruning and cluster weights against the control block and helped vines recover from harvest stress. Together, these products offer microbial diversity and strength. Ultimately, they lead to healthier, more productive vines.

For more information, contact:
Biologically Integrated Organics, Inc.
1720 Moon Mountain Dr.
Sonoma, CA 95476
tel: 707/939-8090; fax: 707/939-8092
e-mail: sales@bio-inc.com
website: www.bio-inc.com

VINTAGE NURSERIES

Vintage Nurseries is a California-certified nursery that produces grapevines for the wine, table, and raisin industries. Established in 1989 by brothers Jeff and Greg Sanders, Vintage Nurseries has become one of the largest producers of dormant field-grown, bench-graft grapevines in North America.

V
Vintage

Vintage Nurseries specializes in production of certified dormant benchgrafts, greenhouse-grown potted benchgrafts, dormant rootstock rootings, and other related products. Vintage Nurseries currently ships to grape growers worldwide.

Vintage Nurseries is committed to providing customers with the best quality grapevines and customer service along with the industry's most competitive pricing. Please feel free to request a list of satisfied customers who will confirm that Vintage Nurseries is…"*a cut above.*"

For more information, contact:
Vintage Nurseries
Steve Huffman
International Sales Manager
27920 McCombs Ave., Wasco, CA 93280
tel: 209/523-8036; fax: 209/523-8036
e-mail: steve@vintagenurseries.com
website: www.vintagenurseries.com

PLEASE SEE VINTAGE NURSERIES' AD, PAGE 15.

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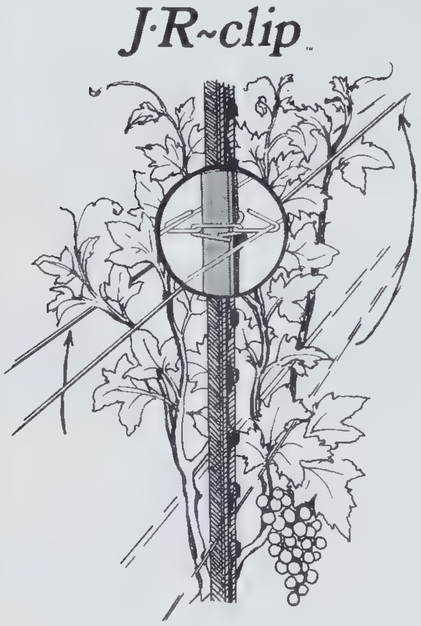

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Diffuse Sunlight

Continued from page 52

Titratable acidity of Grenache on the canopy's south side declined linearly as mid-day PAR increased (Figure IVC). In comparison, the titratable acidity of clusters on the canopy's north side declined as mid-day PAR increased from less than 10 μmol m^{-2} sec^{-1} to 51–100 μmol m^{-2} sec^{-1}, then leveled off. At the same exposure level, titratable acidity was similar on both sides.

In contrast, Cabernet Sauvignon clusters on the north side maintained greater acidity at the same exposure level than clusters on the south side ($p < 0.05$; Figure IVE). Cabernet Sauvignon on both sides of the canopy followed a similar pattern, with titratable acidity decreasing sharply as mid-day PAR increased from less than 10 μmol m^{-2} sec^{-1} to 51–100 μmol m^{-2} sec^{-1}, then leveling off.

Compared to clusters on the canopy's south side, the juice pH of clusters on the north side declined significantly ($p < 0.05$) with increased sunlight exposure in both cultivars (Figures IVE and IVF). Juice pH declined slightly (Grenache), or remained relatively constant (Cabernet Sauvignon), with increased sunlight exposure on the south side.

For clusters on the canopy's north side, skin anthocyanins increased linearly with increased sunlight exposure for both cultivars (Figures VA and VB). For clusters on the canopy's south side, the anthocyanin concentration of both cultivars increased initially, then declined when PAR exceeded 51 to 100 μmol m^{-2} sec^{-1} at mid-day.

For Grenache, clusters on both sides had similar anthocyanin levels until mid-day PAR reached this level. At the same exposure level, Cabernet Sauvignon clusters on the north side of the canopy had greater anthocyanin concentrations than those on the south side ($p < 0.05$).

Total phenols in the skins of both cultivars increased linearly with mid-day PAR for clusters on the canopy's north side (Figures VC and VD). Total phenols increased more gradually with sunlight exposure for clusters on the canopy's south side. At the same exposure level, clusters on the canopy's north side were greater in total phenolics than clusters on the south side ($p < 0.05$).

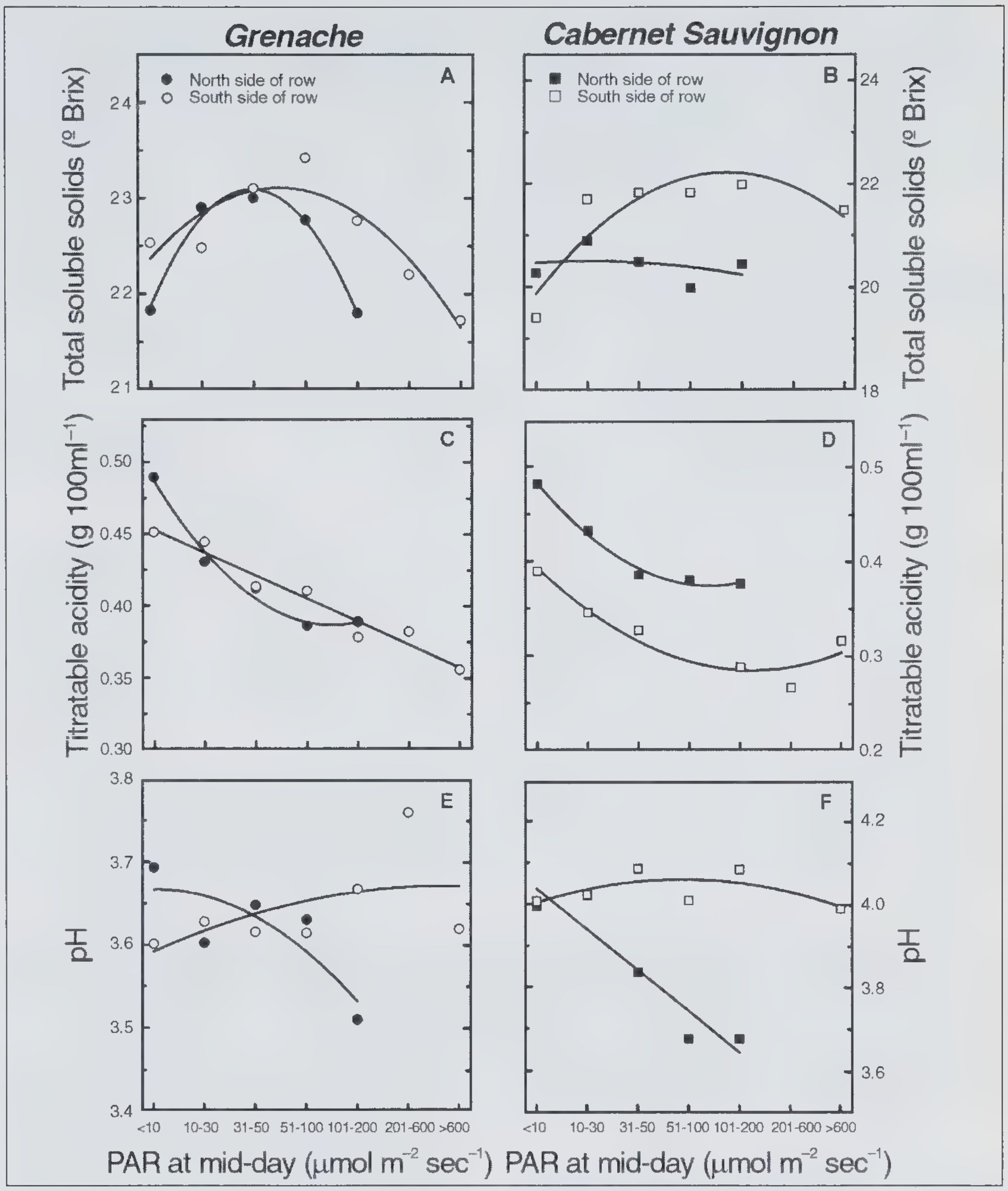

Figure IV Influence of cluster sunlight exposure on total soluble solids, titratable acidity, and juice pH of Grenache (**A, C,** and **E,** respectively) and Cabernet Sauvignon (**B, D,** and **F**, respectively) grape berries. Refer to Fig. 3 for explanation of PAR exposure classes. Data were fitted to the following equations: Total soluble solids — Grenache: north side of row $y = 21.867 + 1.242x - 0.315x^2$, $r^2 = 0.985$; south side of row $y = 22.362 + 0.596x - 0.119x^2$, $r^2 = 0.833$. Cabernet Sauvignon: north side of row $y = 20.456 + 0.061x - 0.030x^2$, $r^2 = 0.105$; south side of row $y = 19.865 + 1.260x - 0.169x^2$, $r^2 = 0.804$. Titratable acidity — Grenache: north side of row $y = 0.487 - 0.058x + 8.302 \times 10^{-3}x^2$, $r^2 = 0.984$; south side of row $y = 0.453 - 0.016x$, $r^2 = 0.954$. Cabernet Sauvignon: north side of row $y = 0.483 - 0.064x + 9.5456 \times 10^{-3}x^2$, $r^2 = 0.989$; south side of row $y = 0.393 - 0.051x + 6.027 \times 10^{-3}x^2$, $r^2 = 0.916$. pH — Grenache: north side of row $y = 3.667 + 1.489 \times 10^{-3}x - 8.796x^2$, $r^2 = 0.669$; south side of row $y = 3.592 + 0.028x - 2.410 \times 10^{-3}x^2$, $r^2 = 0.297$. Cabernet Sauvignon: north side of row $y = 4.037 - 0.098x$, $r^2 = 0.874$, south side of row $y = 4.004 + 0.039x - 6.76 \times 10^{-3}x^2$, $r^2 = 0.443$.

DISCUSSION

As suggested previously by R. E. Smart and T. R. Sinclair,[21] berry temperature increased linearly with sunlight exposure in this study. The mid-day temperature of fully exposed berries was 9° to 10°C greater compared to

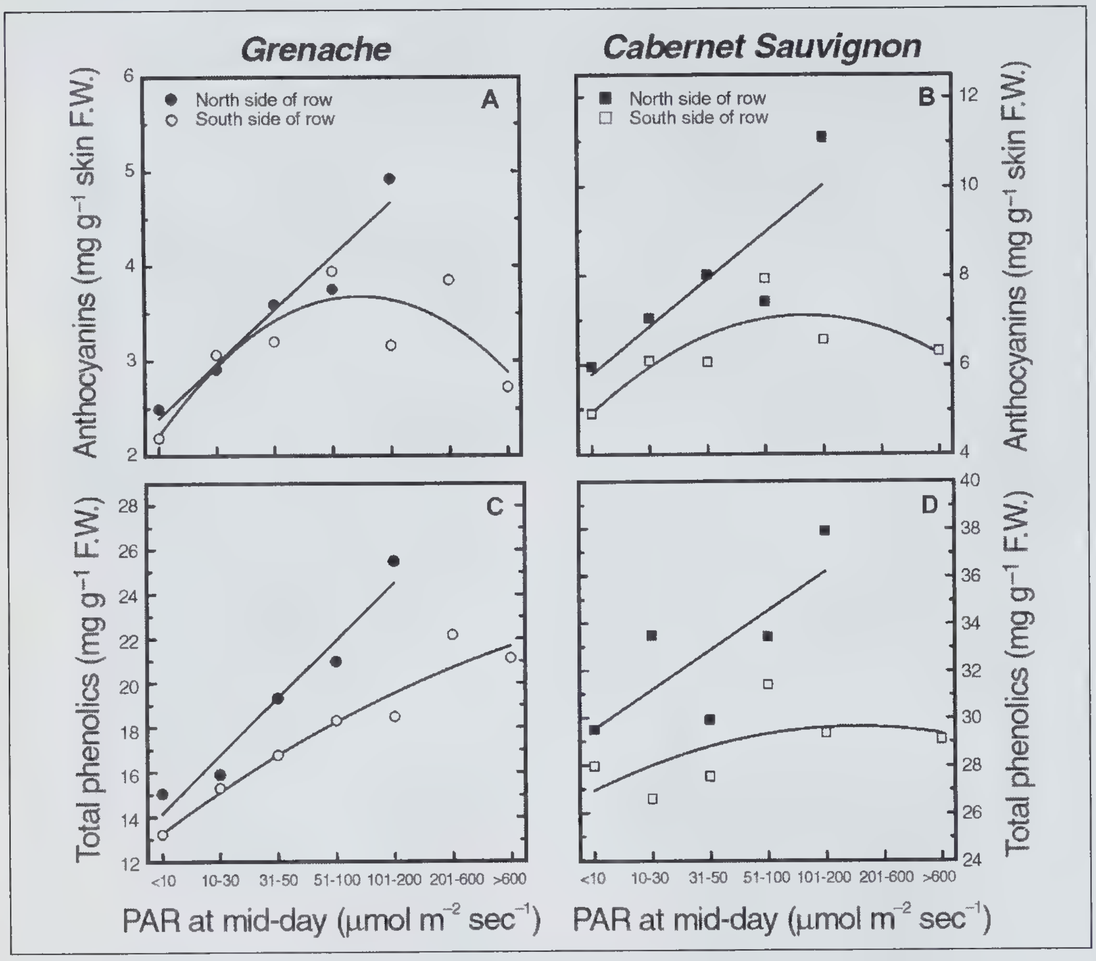

Figure V Influence of cluster sunlight exposure on the anthocyanin and total phenol concentrations of Grenache (**A** and **C**, respectively) and Cabernet Sauvignon (**B** and **D**, respectively) grape berry skins. (See Fig. 3 for PAR exposure classes.) Data were fitted to the following equations: Anthocyanins — Grenache: north side of row $y = 2.394 + 0.570x$, $r^2 = 0.942$; south side of row $y = 2.211 + 0.848x - 0.123x^2$, $r^2 = 0.722$. Cabernet Sauvignon: north side of row $y = 5.782 + 1.064x$, $r^2 = 0.757$; south side of row $y = 4.928 + 1.186x - 0.161x^2$, $r^2 = 0.693$. Total phenolics — Grenache: north side of row $y = 14.147 + 2.595x$, $r^2 = 0.952$; south side of row $y = 13.279 + 1.910x - 0.085x^2$, $r^2 = 0.938$. Cabernet Sauvignon: north side of row $y = 29.492 + 1.674x$, $r^2 = 0.607$; south side of row $y = 26.940 + 1.182x - 0.130x^2$, $r^2 = 0.367$.

shaded berries. When accumulated during the entire fruit development period, this difference likely accounts for a significant portion of the compositional variation reported between sunlight-exposed and shaded grapes.[7,9,11,13]

Temperature differences also explain why fruit response to sunlight varied due to cluster position within the canopy. Direct sunlight heats plant tissues more efficiently than diffuse light.[21] Fully and moderately exposed clusters on the canopy's south side received direct sunlight in the afternoon, while clusters on the north side received mostly indirect or diffuse light during this period.

At similar sunlight exposure levels, the mid-day berry temperature of clusters on the canopy's north side was 3º to 4ºC lower than that of clusters on the south side. It should be noted that temperature differences between sunlight-exposed and shaded berries reported here, for a warm climate (Region V), may be less pronounced in a cooler climate (such as Region I or II[22]).

In a separate study, Nick Dokoozlian reported that berry growth of Cabernet Sauvignon increased as cluster exposure to sunlight increased under controlled conditions, but light exposure had no effect on berry temperature.[5]

The gradual decline in berry mass of Grenache with increased sun exposure reported here may have resulted from effects of elevated berry temperatures on berry cell division or elongation, increased fruit transpiration rates, and subsequent berry dehydration.[4,7,11]

A similar explanation can be made for the lower mass of Cabernet Sauvignon berries on the canopy's south side. Contrary to this trend, the berry mass of Cabernet Sauvignon increased linearly with increasing exposure for north side clusters. Berry growth may therefore be enhanced by increased exposure to indirect light, as long as fruit temperatures are not elevated beyond the optimum for development.[7,13]

Soluble solids reached their maximum when mid-day cluster exposure ranged between 31 to 50 µmol m⁻² sec⁻¹ for Grenache and 51 to 100 µmol m⁻² sec⁻¹ for Cabernet Sauvignon. The increased temperature of grapes exposed beyond these levels may have inhibited ripening, as previous research indicated that cluster temperatures higher than 37°C inhibited sugar accumulation.[10]

The decline in titratable acidity with increasing sunlight exposure is in accord with previous findings,[3,11,17,20] and was attributed to increased malic acid degradation due to higher temperatures in exposed grapes.[9,11,14]

Increased sunlight exposure had little effect on the juice pH of clusters on the canopy's south side, likely because their elevated temperature was a more important factor influencing pH than light exposure[7,9,10] In contrast, results for north side grapes were similar to previous studies reporting that exposed clusters have lower juice pH than shaded clusters.[19,20]

These studies also implied that foliage exposure to sunlight may regulate fruit pH; however, all experimental shoots were exposed to similar levels of sunlight. It should be noted that analyses were performed on previously frozen berries, thus pH may have been elevated as a result of tartrate precipitation.[1]

While increased exposure to light generally stimulates anthocyanin accumulation in grape berries, high temperatures inhibit color formation.[8,10,12] In this study, the anthocyanin concentration of both cultivars increased linearly as sunlight exposure increased on the canopy's north side. In contrast, a quadratic relationship was found on the south side, where maximum coloration occurred when berries were exposed to 51–100 µmol m^{-2} sec^{-1} PAR at mid-day.

A.J.G. Pirie reported in another study that the optimum temperature range for anthocyanin accumulation is between 17° and 26°C.[16] The lower anthocyanin concentration of clusters exposed to greater than 100 µmol m^{-2} sec^{-1} PAR at mid-day on the canopy's south side is likely a consequence of their elevated temperature, as indicated by earlier studies.[10,12] Lower total phenolic concentrations of grapes on the south side were likely a result of this same interaction.

CONCLUSIONS

In addition to regulating photosynthesis and photo-morphogenesis, sunlight provides radiant energy, which heats plant surfaces. Berry composition is influenced by both the direct (light quantity and quality) and the indirect (temperature mediated) effects of sunlight exposure.

Cluster location within the canopy had a significant influence on the relationship between sunlight exposure and berry temperature in this study. It is generally accepted that as fruit exposure to sunlight increases, fruit composition and wine quality improve.[19]

Results of this study were in agreement with the above for clusters located on the canopy's north, or afternoon-shaded, side. However, when clusters were located on the south or afternoon sun-exposed side, concomitant increases in berry temperature were likely a major factor regulating fruit responses to increased sunlight exposure. Berry color, in particular, was negatively affected by excessive sunlight exposure in this study.

Canopy management practices that provide high amounts of diffuse light in the fruiting zone, rather than direct sunlight exposure, are best suited to warm regions such as the San Joaquin Valley (Region V). Training and trellising systems, row orientation, and canopy management practices should be considered carefully in order to avoid prolonged fruit exposure to direct sunlight in such regions. ■

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References

1. Amerine, M.A., and C.S. Ough. *Methods for analysis of musts and wines*, p. 341. Wiley and Sons, New York (1980).

2. Coombe, B.G. "Adoption of a system for identifying grapevine growth stages." *Austral. J. Grape Wine Res.* 1:100-110 (1995).

3. Crippen, D.D., and J.C. Morrison. "The effects of sun exposure on the compositional development of Cabernet Sauvignon berries." *Am. J. Enol. & Vitic.* 37: 235-242 (1986).

4. Crippen, D.D., and J.C. Morrison. "The effects of sun exposure on the phenolic content of Cabernet Sauvignon berries during development." *Am. J. Enol. & Vitic.* 37: 243-247 (1986).

5. Dokoozlian, N.K. "Light quantity and light quality within *Vitis vinifera L.* grapevine canopies and their relative influence on berry growth and composition." Ph.D. Diss., University of California, Davis. 1990.

6. Dokoozlian, N.K., and W.M. Kliewer. "Influence of light on grape berry growth and composition varies during fruit development." *J. Amer. Soc. Hort. Sci.* 121(5): 869-874 (1996).

7. Hale, C.R., and M.S. Buttrose. "Effect of temperature on ontogeny of berries of *Vitis vinifera L.* cv. Cabernet Sauvignon." *J. Amer. Soc. Hort. Sci.* 99(5): 390-394 (1974).

8. Kliewer, W.M. "Effect of day temperature and light intensity on coloration of *Vitis vinifera L.* grapes." *J. Amer. Soc. Hort. Sci.* 95(6): 693- 697 (1970).

9. Kliewer, W.M. "Effect of day temperature and light intensity on concentration of malic and tartaric acids in *Vitis vinifera L.* grapes." *J. Amer. Soc. Hort. Sci.* 96(3): 372-377 (1971).

10. Kliewer, W.M. "Influence of temperature, solar radiation, and nitrogen on coloration and composition of Emperor grapes." *Am. J. Enol. & Vitic.* 28: 96-103 (1977).

11. Kliewer, W.M., and L.A. Lider. "Influence of cluster exposure to the sun on the composition of Thompson Seedless fruit." *Am. J. Enol. & Vitic.* 19: 175-184 (1968).

12. Kliewer, W.M., and R.E. Torres. "Effect of controlled day and night temperatures on grape coloration." *Am. J. Enol. & Vitic.* 23(2): 71-76 (1972).

13. Kobayashi, A., T. Fukushima, T. Nii, and K. Harada. "Studies on the thermal conditions of grapes. VI. Effects of day and night temperatures on yield and quality of Delaware grapes." *J. Jap. Soc. Hort. Sci.* 36: 1-7 (1967).

14. Lakso, A.N., and W.M. Kliewer. "The influence of temperature on malic acid metabolism in grape berries. II. Temperature responses of net dark CO_2 fixation and malic acid pools." *Am. J. Enol. & Vitic.* 29(3): 145-149 (1978).

15. Mabrouk, H., and H. Sinoquet. "Indices of light microclimate and canopy structure of grapevines determined by 3D digitizing and image analysis, and their relationship to grape quality." *Austral. J. Grape & Wine Res.* 4: 2-13 (1998).

16. Pirie, A.J.G. "Phenolics accumulation in red wine grapes (*Vitis vinifera L.*)." Ph.D. Diss., University of Sydney. 1977.

17. Reynolds, A.G., R.M. Pool, and L. Mattick. "Influence of cluster exposure on fruit composition and wine quality of Seyval blanc grapes." *Vitis* 25: 85-95 (1986).

18. Slinkard, P., and V.L. Singleton. "Colorimetry of total phenolics with phosphotungstic acid reagents." *Am. J. Enol. & Vitic.* 28: 49-55 (1977).

19. Smart, R.E. "Principles of grapevine canopy management micro-climate manipulation with implications for yield and quality: A review." *Am. J. Enol. & Vitic.* 36: 230-239 (1985).

20. Smart, R.E, J.B. Robinson, G.R. Due, and C.J. Brien. "Canopy microclimate modification for the cultivar Shiraz. II. Effects on must and wine composition." *Vitis* 24: 119-128 (1985).

21. Smart, R.E., and T.R. Sinclair. "Solar heating of grape berries and other spherical fruits." *Agric. Meteorol.* 17: 241-259 (1976).

22. Winkler, A.J., J.A. Cook, W.M. Kliewer, and L.A. Lider. *General Viticulture*, 2d ed., University of California Press, Berkeley (1974)

WINERY LABORATORY QUALITY

by Sue Weeks

Measuring, maintaining, and trouble-shooting pH

This column will provide you with information that will allow you to get the most out of one of the most important tools in your laboratory — your pH meter. Learn how to improve accuracy and extend the lifespan of your electrode. First, some history:

Did you ever wonder where the abbreviation pH comes from? It is from the term "pondus hydrogenii," meaning the concentration of hydrogen ions.

The term was coined in 1909 by Danish scientist S. P. L. Sorensen, who defined pH as a negative base 10 logarithm of hydrogen ion concentration. The pH system gives us an easy way of expressing the concentration (activity) of hydrogen ions, without using unwieldy numbers like 1/10,000,000 (10^{-7}) instead of pH 7. The scale gives us simple numbers (1 to 14) to represent 1/100,000,000,000,000 (10^{-14}). Because the logarithm is negative, the concentration of hydrogen ions is lower as the pH goes higher, which is why the lower end of the scale is considered acidic while the higher end is basic.

A pH meter and electrodes create a simple galvanic cell (battery) that measures in millivolts (mv) and uses software to convert those measurements to pH units.

The electrode works by generating a voltage created by concentration differences at the electrode outer surface compared to the inner surface. The surface of the electrode is the point where H+ ion exchange occurs, and is the weakest point of the electrode. *All* measurements rely on the condition of the surface being clean and reasonably reproducible. So, how do we ensure that the electrode is working properly?

Calibrating a pH meter

Validating pH measurement is an easy task. A pH meter and electrode are basically calibrated to known standards. Good quality ***traceable*** buffers are the main validation tool. Choose buffers that are within the outer limits of the range of pH that you will be measuring (usually a four and a seven buffer), and make sure that they are within the expiration date on the bottle. Use fresh buffer daily and do not pour used buffers back into the bottle.

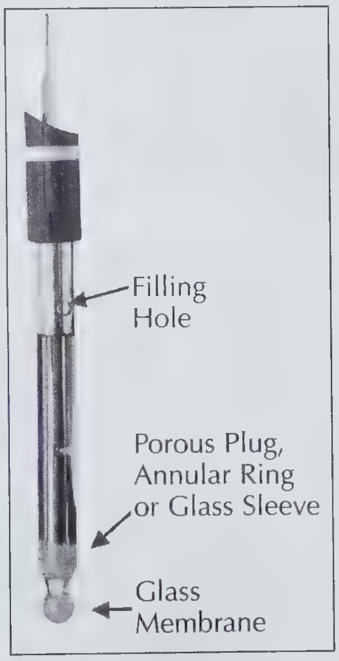

Figure 1: Diagram of an electrode

Other ways to validate pH measurements

You can validate your pH measurements by preparing your own buffer solutions. However, please note that to ensure the validity of this procedure, a calibrated balance and analytical grade reagents are critical.

4.01 buffer

For 0.05M potassium hydrogen phthalate (KHP), dissolve 10.211 g of KHP in distilled (CO_2-free) water and make up to 1000 mL at 20°C (NB: before use, dry the reagent at 120°C for two hours).

6.88 buffer

To make 0.025M potassium dihydrogen orthophosphate (KH_2PO_4) and 0.025M disodium hydrogen phosphate (Na_2HPO_4): dissolve 3.39 g of KH_2PO_4 and 3.54 g of Na_2HPO_4 in distilled (CO_2-free) water and make up to 1000 mL at 20°C. (NB: before use, dry the reagents at 120°C for two hours).

It is important to remember the following:

- Buffers should be freshly poured every day.
- Opened buffers should be used within three months of opening.
- Write the date on a freshly opened bottle and dispose of the contents after three months.
- Always check batch expiration dates on buffers when you receive them.
- Use clear buffers if possible. While colored buffers are easy to distinguish, the dyes in them can clog the pores of the electrode, slowing response time. This is especially true if the electrode is stored in colored buffers.
- Buffers can be stored in the refrigerator or in a cupboard, provided they are brought to room temperature before use.
- Buffers should be no more than 3 pH units apart. Many people ask about using buffers that cover the range of pH used in the wine industry (such as from around 3 to 8). Most manufacturers believe it is better to use buffers that are 3 units apart that are close to the limits of pH, rather than to select buffers at each extreme.
- Buffers should all be the same temperature as each other (including samples).
- Buffers should have the same stirring conditions (preferably **not** hand stirring).
- Buffers should have the same waiting time (signal stability).

All of this is to emphasize that the *precision of your measurement will greatly depend upon the care you take during calibration!*

Your pH meter should be calibrated daily — more often if there is a large fluctuation in ambient temperature difference between morning and afternoon (as in non-temperature controlled laboratory facilities).

For accurate measurements, it is critical that the temperature of the buffers is the same (within a few degrees) as the sample. Temperature not only affects the voltage produced by the electrode but also how the sample dissociates. Both will produce actual changes in pH. For this reason, pH of a sample should always be accompanied by the temperature measurement recorded at the time of the pH reading.

Remember that the temperature correction only works for the buffers where there is a known dissociation constant. It does not compensate for large temperature differences between buffers and samples, such as storing in the refrigerator prior to measurement.

Electrode health

The health of the electrode is the critical factor in accurate and reproducible pH measurement.

The most important part of an electrode is the glass membrane or the round bit on the bottom. This area is where the ions flow and connect the circuit so that the galvanic cell (pH meter) can measure the millivolts and convert them to pH units. This membrane is a little like the surface of a contact lens, with the surface made up of tiny holes. These holes expand and contract when in contact with different liquids. When new, or after a long period of storage, the electrode must be hydrated by soaking in an aqueous solution prior to use to stabilize the membrane surface.

There are many things that can clog or impede these holes. First, as mentioned earlier, if you store your electrode in colored buffers they may clog the membrane. Grape solids and wine phenolics are also culprits, so electrode maintenance and cleanliness during harvest is of vital importance.

A weekly cleaning procedure is recommended. Check the manufacturer's instructions for cleaning protocols. Many cleaning procedures alter the size of the membrane pores, so it is important to allow it to soak in buffer or 2M Potassium Chloride (KCl) solution for at least 30 minutes, sometimes longer if you have undertaken any cleaning with basic or acidic solutions.

You should also replace the filling solution if you have a refillable electrode.

It is also good to remember never to wipe your electrode with a tissue. This is the equivalent of dragging a tissue over a sieve — the particles of tissue embed themselves in the pores. If you need to dry the electrode for any reason, just touch it with a tissue and allow the liquid to draw off without wiping. Always re-calibrate after a cleaning procedure.

Flow of ions

There are several different types of combined pH electrodes (where the glass electrode and reference electrode are combined into a single entity) that are available for use in wineries. Most of the differences can be found in the material used to manufacture the electrode and also the way in which the ions flow from it. Some electrodes are made of glass and others from epoxy resin.

Although the epoxy resin type is much tougher, please remember that the inner structure and the membrane are usually glass, so care should still be taken. Many brands of electrode also have a plastic or epoxy guard around the glass membrane protecting it from accidental knocks and the occasional renegade stirring bar.

Ion flow around the membrane is dependent on the type of mechanism that allows the ions to flow from the electrode. There are three main types: porous plug, annular ring, and sleeve-in-sleeve.

The porous plug type consists of a very small porous disc above the glass membrane of the electrode. This type of electrode might be fine for normal wine use if carefully maintained, but is not recommended for use during harvest, as juice and grape solids block it very easily.

The annular ring, which is a large porous area that encircles the electrode, has a much greater surface area, so it is quite difficult to block, especially if regular maintenance is carried out.

The sleeve-in-sleeve type of electrode allows for easy cleaning and is virtually impossible to block. The disadvantage of this and the annular ring type is that the electrode will need filling more often to maintain ion flow. It is also important to remember when using the electrode to make sure that the porous area is below the surface of the liquid. If it is above the liquid surface, the ions cannot travel to the glass membrane and close the circuit.

When the pH meter is not in use, it is wise to store the electrode immersed in a solution.

That solution might be:

- Distilled water (short term only)
- Either 4 or 7 Buffer (not colored)
- 2M KCL

The calibration process

First a bit more theory:

Sensitivity (or slope) — what does it mean?

Each pH unit theoretically equals 59.2 mv (based on the reference hydrogen electrode). Therefore, the difference between our two calibration points of 4 and 7 is about 177.6 mv. Sensitivity is measured using this theoretical 177.6 mv.

In theory pH 4 is about 177 mv, pH 7 is about 0 mv. These measures are dependent on the health of your electrode.

For example:

millivolt reading of pH 7 buffer = –10 mv
millivolt reading of pH 4 buffer = 160 mv

difference = 170 mv $\quad \dfrac{170\text{ mv}}{177.6\text{ mv}}$ = 95.7% sensitivity/slope

The calculation above shows us that the sensitivity/slope for this calibration is 95.7%.

As you can see, it would also be possible to have a slope greater than 100% if the millivolt difference was greater than 177.6 mv.

Zero pH

Zero pH is a way of monitoring the health of your pH system, and in particular the electrode. Zero pH is defined as the pH value at which the measured potential is zero, that is where the slope line passes through the x axis. Many pH meters give a zero pH, but it would be easy to construct on a spreadsheet if your pH meter does not have this facility.

How does this work?

If you take the example above, the slope or sensitivity of that calibration is 95.7%. If you took another reading with the same pH meter two weeks later:

millivolt reading of pH 7 = –30 mv
millivolt reading of pH 4 = 140 mv

difference = 170 mv $\quad \dfrac{170\text{ mv}}{177.6\text{ mv}}$ = 95.7% sensitivity/slope

Now you can see that the slope of this calibration is still 95.7% even though the millivolt reading of each buffer was quite different from the initial calibration above. You would believe that everything with your pH meter is fine because you are still achieving a good slope percentage, but the calibration has obviously shifted due to the change in millivolt readings of the buffers.

A difference such as this will change all the pH readings for samples because the electrode is affected. If you were to undertake a cleaning procedure of the electrode, you would find that the millivolt readings should return close to that of the original calibration. If you can measure either the millivolt readings or the zero pH on a daily basis and record them, you will always have a good idea of the current health of your electrode.

If the electrode fails to respond, then it may be time to purchase a new one. Contrary to the beliefs of some observors, electrodes have a finite life. This could be due to a degeneration of the membrane surface, deterioration of the porous plug/annular ring or an ion depleted reference system. However, a properly cared for, good quality electrode should last for several years.

Troubleshooting

O.K., so you have calibrated the pH meter and everything seems in order, but you still don't seem to be getting the expected results. What else could be wrong? Below you will find a list of possible causes to work through that may help solve the problem.

Buffers

- Are they the same temperature as each other and the samples? Remember automatic temperature correction only works for the buffers, not the samples.
- Have they been freshly poured today? Buffers left out in the open will also absorb carbon dioxide from the air; and they should either be covered (which might extend their life to a couple of days) or replaced daily.
- Have they been open more than three months? If so there is a chance they have absorbed contaminants, such as carbon dioxide, from the headspace. This is likely to reduce accuracy of the buffer.
- Are they out of date (check expiration date)?

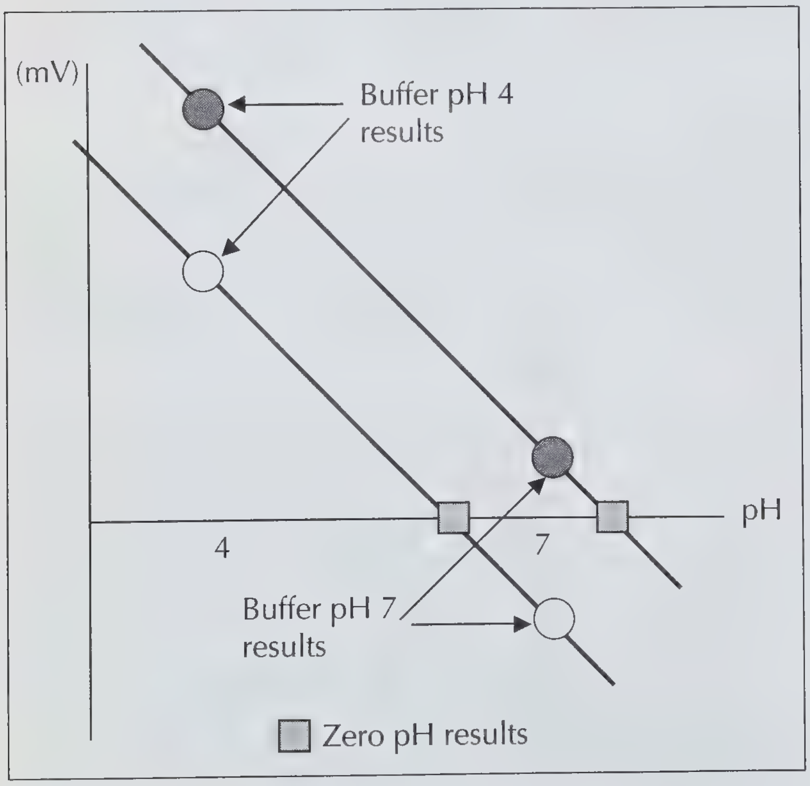

Figure 2: This graph demonstrates how the sensitivity/slope of two calibrations could remain constant, while the actual pH calibration could be quite different and how this could be identified using the zero pH measure or by recording millivolt readings on a daily basis.

- Is there a computer in close proximity to the pH meter? Don't forget that the meter is measuring small amounts of electrical energy and sometimes static and magnetic energy will interfere. Most pH meters now have methods of counteracting this. To see if your pH meter is sensitive, lift the electrode out of solution and cup your hand around it. If the pH fluctuates significantly, then either your pH meter is sensitive, or you have an excess of animal magnetism!
- Is the electrode cord correctly plugged in or is it damaged in some way? It is not unknown for an electrode cord to be damaged accidentally by closing it in a nearby drawer. The outer flex may show no damage at all but the wires within maybe damaged or even severed.

Stirring

- Is the sample being stirred? If not, then the flow of ions to make the circuit will be very slow, making the response time unacceptable. Similar things can occur if the sample is stirred too slowly. Make sure that the stirring speed is constant for buffers and samples.
- Is the sample being stirred too fast? If so, it may be forming a vortex and providing limited contact with the electrode.

Electrode

- Where is the level of the filling solution? If the level is too low, the solution will not flow from the electrode at the right rate, slowing response time. Check the filling solution level weekly or more often if the electrode is stored in distilled water.
- Is the filling hole plugged during use? If so, the solution will not flow due to back pressure. Cover the filling hole when not in use to conserve filling solution and to prevent crystalline build up but *always* have it uncovered during use.
- Are there air bubbles in your filling solution? If so, they should be removed, as they will also interfere with ion flow. You can remove them by gently flicking the electrode with your finger until the bubbles rise to the surface, or if you are particularly brave, you can perform a centrifuge-like action by unplugging the electrode from the meter and twirling it around by the cord. If you choose this adventurous method, please allow sufficient space between the electrode and any potential contact targets and hold the plug of the electrode in your other hand. Apparently there have been some reported electrode "deaths" from technicians inadvertently hitting the bulb of the electrode against a free swinging plug!
- If your electrode is the type that should have crystals in the bulb, make sure they are present and free-flowing. If they seem to be clumped together, soak your electrode in warm water (~60ºC) for a while. This should free up the crystals.
- Is the porous part of the electrode below the liquid surface? If not, the circuit cannot be closed and the results will be incorrect. Make sure that the porous plug, annular ring or sleeve of the electrode is in the solution.
- Are the pores of the glass membrane blocked? If they are, you will get a slow response and inaccurate measurements. As mentioned, this is the critical factor in the accuracy of pH measurement, so clean your electrode regularly as per your manufacturer's directions and monitor your zero pH as described above. Also worth mentioning again: don't store your electrode in colored buffers and try not to wipe the glass membrane with a tissue.

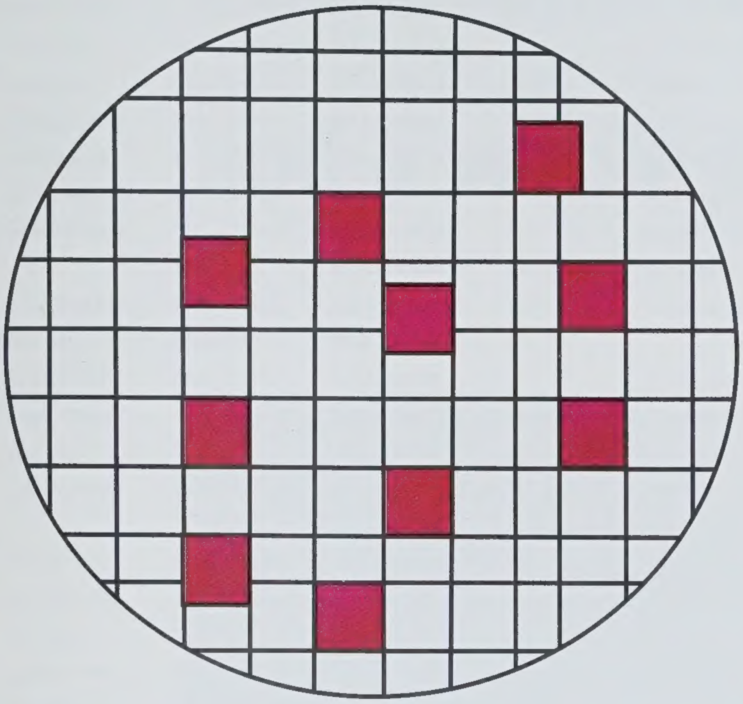

Figure 3: The glass membrane of the electrode is similar to a contact lens in that it swells and shrinks depending on the solution the electrode is stored in.

The small pores that normally allow the hydrogen ions through can also become blocked due to proteins and fat deposits.

Conclusion

The take home message for measuring pH is:

- The source of problems is almost always the electrode.
- A little regular maintenance for your electrode will save you a lot of time, money and frustration and, in the long-term, will produce reliable and accurate results.
- Invest in a good quality electrode.

Remember, correct and regular maintenance of your electrode will mean:

- Fast response,
- A longer life for the electrode, and most important,
- *Accurate* and *reproducible* results! ■

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Sue Weeks is an Australian wine laboratory consultant. She provides assistance in areas of formal or informal quality system implementation, method validation, and troubleshooting, laboratory setup, personnel selection, and staff training. She also facilitates international wine-industry training in conjunction with the Communicating for Agricultural Exchange Program (CAEP), in Fergus Falls, MN. She visits America often and can be contacted through the Bibber International website at www.bibber.com.au or by fax at 618/8563 2433. She can also be contacted through Gordon Burns at ETS Laboratories (St. Helena, CA) at tel: 707/963-4806.

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Grape Bunch Exposure

Continued from page 14

10. Tarara, J.M., Ferguson, J.C., and Spayd, S.E. "A chamber-free method of heating and cooling grape clusters in the vineyard." *Am. J. Enol. & Vitic.* 51 (2) 182–188, 2000.

11. Schneider, R., Razungles, A., Charrier, F., and Baumes, R. "*Effet du site, de la maturité et de l'éclairement des grappes sur la composition aromatique des baies de* Vitis vinifera *L. cv. Melon B. dans le vignoble du Muscadet.*" Proceedings 26th World Congress of OIV, Adelaide, 128–138, 2001.

12. Razungles, A.J., Baumes, R.L., Dufour, C., Sznaper, C.N., and Bayonove, C.L. "Effect of sun exposure on carotenoids and C13-norisoprenoid glycosides in Syrah berries (*Vitis vinifera* L.)." *Sciences des Aliments* 18, 361–373, 1998.

13. Bureau, S.M., Baumes, R.L., and Razungles, A. "Effects of vine bunch shading on the glycosilated flavor precursors in grapes of *Vitis vinifera* L. Cv Syrah." *J. Agric. Food Chem.* 48, 1290–1297, 2000.

14. Reynolds, A.G., Wardle, D.A., and Dever, M. "Vine performance, fruit composition and wine sensory attributes of Gewurztraminer in response to vineyard location and canopy manipulation." *Am. J. Enol. & Vitic.* 47 (1) 77–92, 1996.

15. Versini, G., Nicolini, G., Dalla Sera, A., Schneider, R., and Rapp, A. "Flavour development in Chardonnay and Mueller Thurgau in the vineyard and during wine ageing." Proceedings 5th Int. Symp. Cool Climate Viticulture & Enology, Melbourne, 2000.

16. Bureau, S.M., Razungles, A.J., Baumes, R.L., and Bajonove, C.L. "Effect of qualitative modifications of light on the carotenoid contents in *Vitis vinifera* L. cv. Syrah berries." *Sciences des Aliments* 18, 485–495, 1998.

17. Razungles, A., Baumes, R., Sauvage, F., and Bayonove, C. "*Le potentiel aromatique de la Syrah: Influence de l'environment de la vigne.*" *Revue des Oenologes* 22 (79) 15–17, 1996.

18. Marais, J.S., van Wyck, C.J., and Rapp, A. "Effect of sunlight and shade on norisoprenoid levels in maturing Weisser Riesling and Chenin blanc grapes and Weisser Riesling wines." *S. Afr. J. Enol. Vitic.* 13, 23–32, 1992.

19. Schulz, H.R., Deibel, M., Loehnertz, O., Bettner, W., Varadi, G., and Versini, G. "Is current level UV-B radiation influencing wine aroma components? Results from five years of field experiments." Proceedings of Intervitis, Stuttgart, 76–84, 2001.

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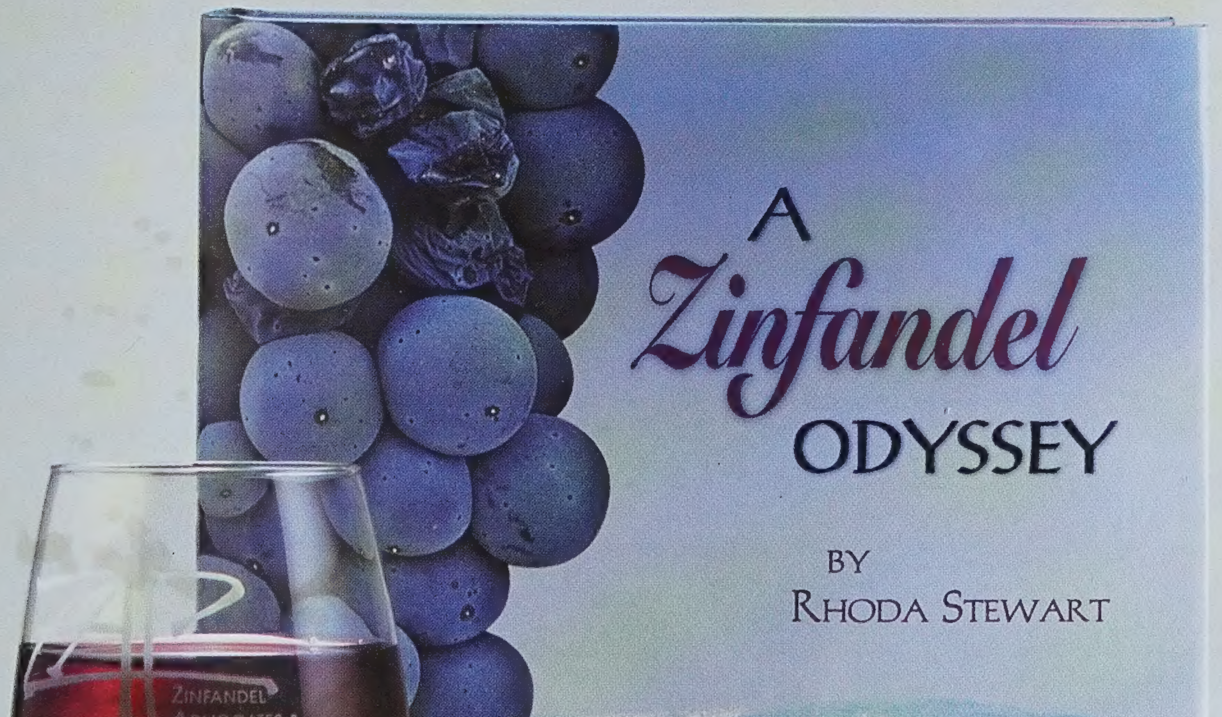

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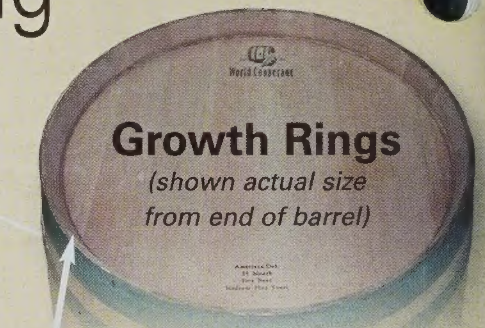

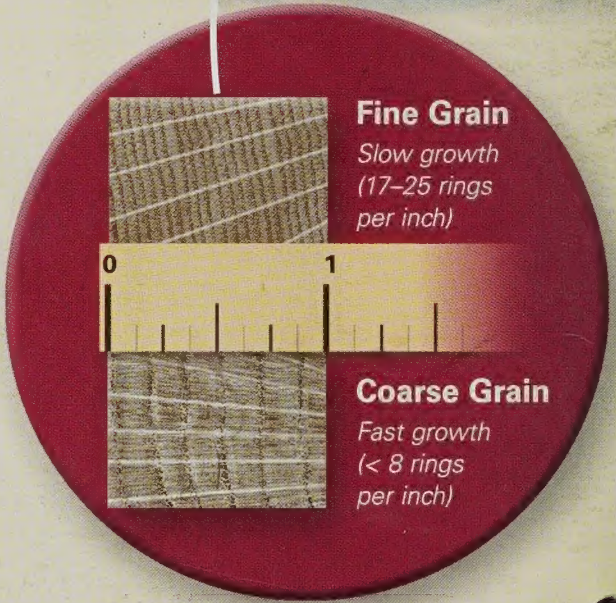

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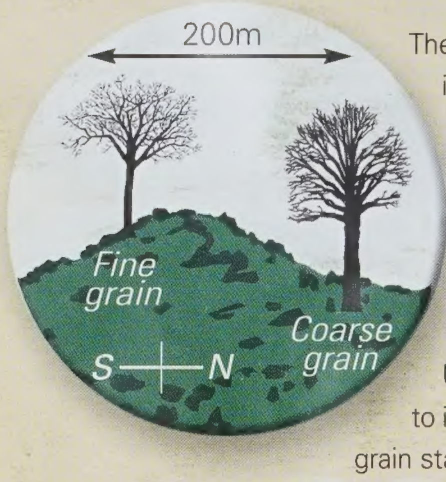

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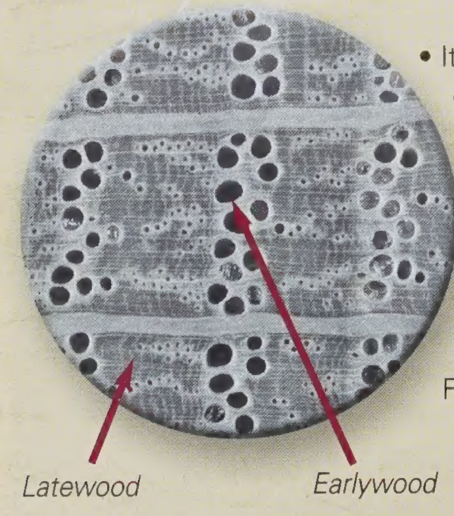

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